Greenhouse Gas Reporting Program

XML Reporting Instructions for Subpart X – Petrochemical Production

United States Environmental Protection Agency
Climate Change Division
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These instructions explain how to report the required data for the applicable regulations. Owners and operators of units should refer to the applicable regulations for information about what data are required to be reported.

EPA has finalized a rule that defers the deadline for reporting data elements used as inputs to emission equations for direct emitters. (See http://www.epa.gov/climatechange/emissions/notices.html for a pre-publication version of the rule). In accordance with the rule, e-GGRT is not currently collecting data used as inputs to emission equations.

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Introduction

The U.S. Environmental Protection Agency's (EPA's) electronic greenhouse gas reporting tool (e-GGRT) extensible markup language (XML) Reporting Schema contains all of the data elements needed to comply with the greenhouse gas reporting program (GHGRP) beginning with the 2010 data collection year. The schema defines expected data elements and attributes, allowable data types for each element, and the hierarchy and order in which elements must appear. Similar to an architectural blueprint that describes the structural design of a house, an XML schema describes the structural design of an XML file. In some cases, it also defines which elements are optional and which are required, and the maximum number of occurrences allowed for each element.

The e-GGRT XML schema includes a root element, complex elements, and simple elements. A simple element is a single piece of data. A complex element is a group of simple elements which are logically grouped together. The root element is the base of the XML schema.

The elements are related to each other in parent-child relationships. The root element is the parent element of the entire schema. Complex elements are children of the root element, and complex elements can also be children of other complex elements. If a complex element is dependent on a parent complex element, the child complex element cannot be included in the XML file unless the appropriate parent complex element is also included.

The XML upload method may be used only for submitting the annual GHG report. User and facility or supplier registration, and the Certificate of Representation, must be entered on-line using e-GGRT.

All XML files submitted to e-GGRT must be well formed and will be accepted only if they conform to the correct and current version of the e-GGRT XML schema.

An XML submission can only contain GHG data for a single facility or supplier. All data for a facility or supplier must be submitted in a single file as a complete report and must include all of the relevant subparts. It is not possible to submit a subset of any portion of a facility's data to add, delete, correct, or update. The entire report must be resubmitted to make any modification at all. Each subsequent submission for the same facility replaces all of the previously submitted data.

The e-GGRT XML schema contains enumerated lists of the units of measures for some data elements and allowable values for some data elements. For rules regarding the unit of measure or allowable values for a specific data element, please refer to the appropriate Data Elements table.

The e-GGRT XML Reporting Schema is available for download at the GHGRP web site here: http://www.epa.gov/climatechange/emissions/e-ggrt_xml.html. The zip file contains:

- **GHG_Final.xsd and Included Files**
- **SchemaChanges.xlsx**

This document provides a step-by-step description of how to report data for Subpart X Petrochemical Production and overall total Subpart X greenhouse gas data for a facility using the XML schema. Please note the following:

- **Not all data elements included in the schema must be reported.** Required or relevant data components and data elements are boxed in red in the schema diagrams and listed in the tables. If a data element is not listed, it does not need to be reported (e.g., deferred data

elements, IsConfidentialBusinessInformationIndicator). Some data elements are conditional and only need to be reported if they are relevant to the reporting facility.

- **Enumerations are case sensitive.** Values must be entered exactly as they are displayed in order to be accepted by schema validation.
- **Data elements must be reported in a specific order.** The figures and tables in this document depict the specific order in which data elements must be reported in order to produce a well-formed XML report.
- **Data elements for calculated and measured values are not displayed in the schema diagrams.** The parent elements for calculated and measured values are displayed in the schema diagrams in this document, but the specific data elements to be reported are not displayed. The descriptions in the XML data elements tables include the specific data elements to report, which are commonly the calculated or measured value and the unit of measure. For some values, the number of times substitute data procedures were used may also be required. See Figure 1 for the expanded view of a sample data element which is a calculated value and Figure 2 for the expanded view of a sample data element which is a measured value.

Figure 1
Sample Calculated Value Schema Diagram

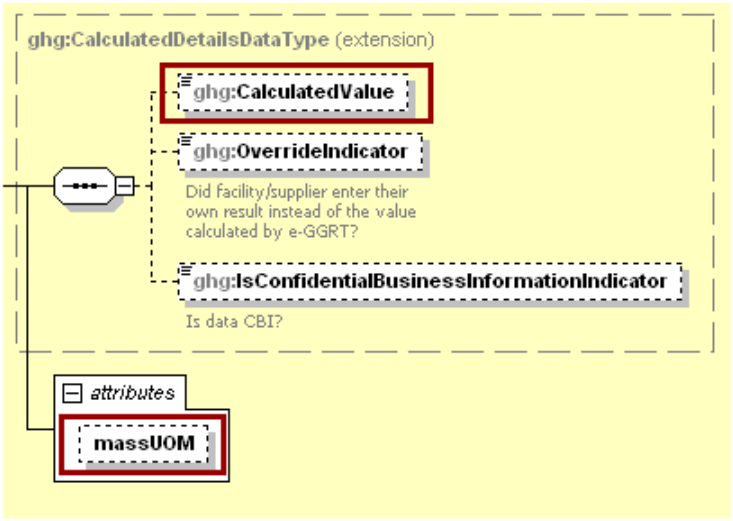


Figure 2
Sample Measured Value Schema Diagram

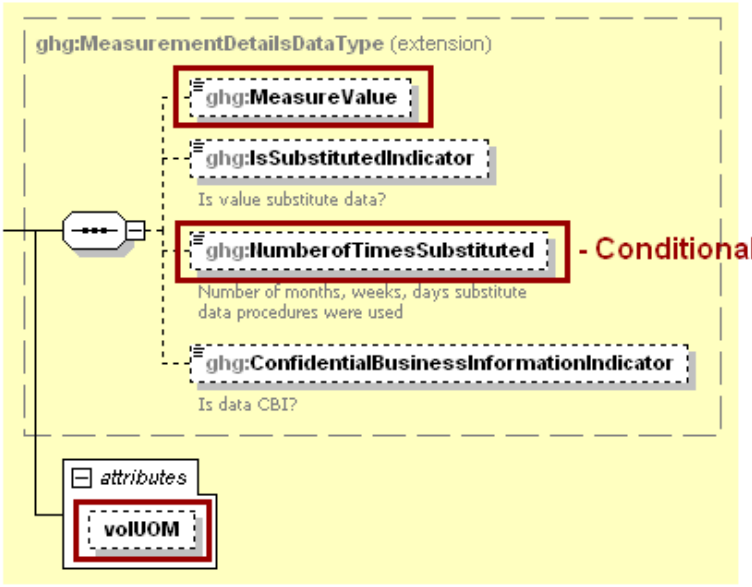
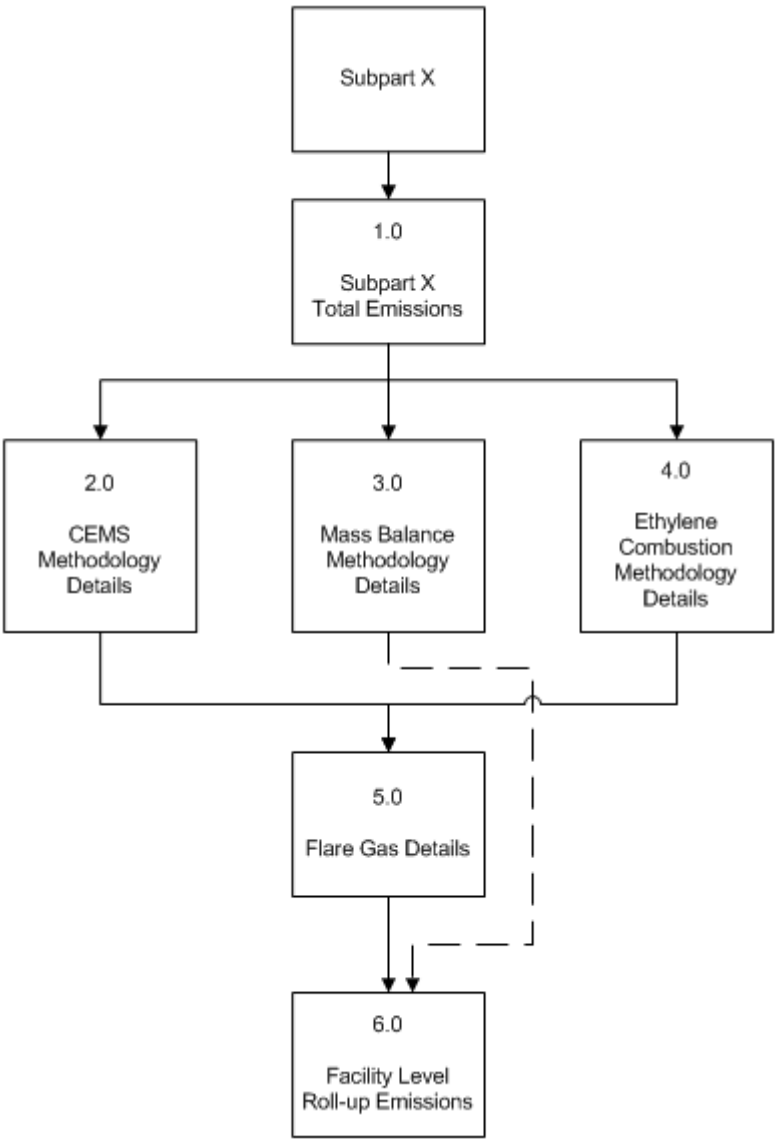


Figure 3
Subpart X Reporting Diagram



The XML schema includes the following areas for reporting for Subpart X, as diagramed in Figure 3 above:

1.0 Subpart X Total Emissions: includes the total greenhouse gas emissions required to be reported for Subpart X.
2.0 CEMS Methodology Details: includes information on each petrochemical process unit for which the CEMS methodology of 98.243(b) was used to estimate emissions and on each CEMS monitoring location.
3.0 Mass Balance Methodology Details: includes information on each petrochemical process unit for which the mass balance methodology of 98.243(c) was used to estimate emissions.
4.0 Ethylene Combustion Methodology Details: includes information on each petrochemical process unit for which the combustion methodology for ethylene production of 98.243(d) was used to estimate emissions.
5.0 Flare Gas Details: includes information on each flare that burns process off-gas for each petrochemical process unit for which the CEMS methodology or the combustion methodology for ethylene production was used to estimate emissions.
6.0 Facility Level Roll-up Emissions: includes information on how to report total emissions for CO_2e (excluding biogenic CO_2) and biogenic CO_2 from Subpart X at the facility level.

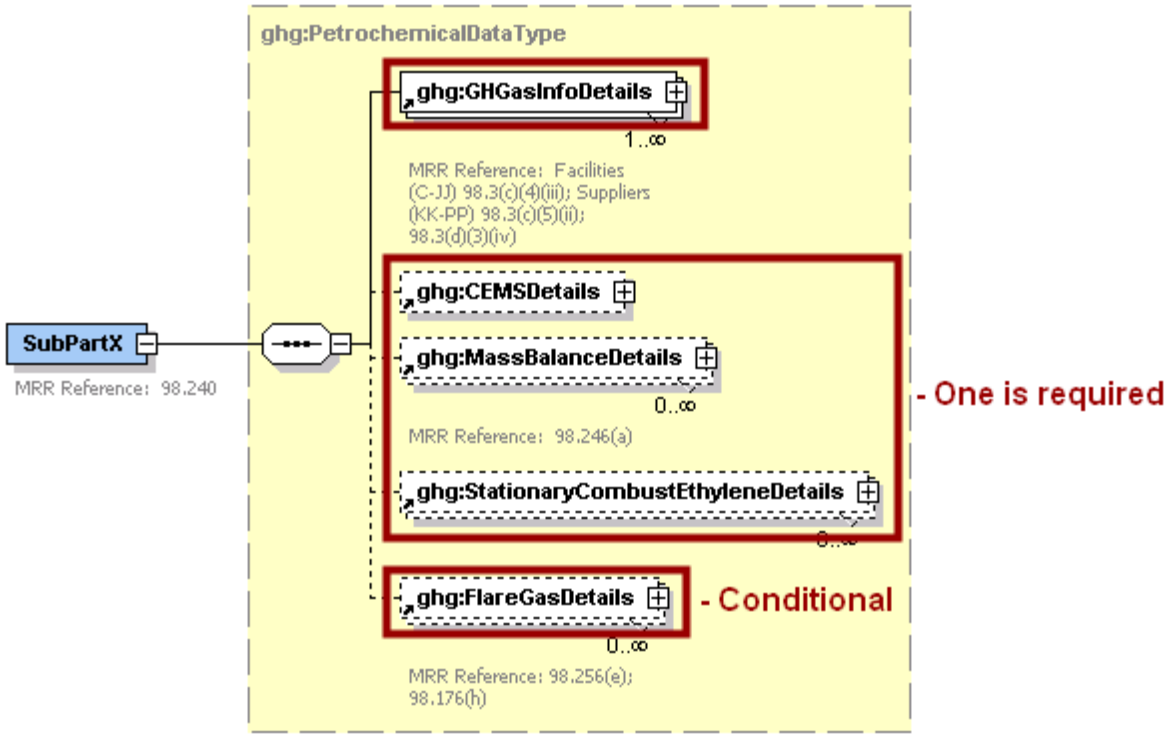
The following terminology is used throughout this document:

- Namespace: A namespace uniquely identifies a set of names such that there is no ambiguity when objects having different origins but the same names are mixed together.
- Markup Language: A way to combine text and extra information to show the structure and layout of a document. This information is expressed using markup, which is typically intermingled with the primary text. A commonly known markup language is HTML.
- XML: A markup language for documents containing structured information. The XML specification defines a standard way to add markup to documents. Its primary purpose is to facilitate the sharing of structured data across different information systems, particularly via the internet.
- XML Schema: An XML schema describes the structure of an XML document. An XML schema defines the set of rules to which the XML document must conform in order to be considered "valid" according to its schema. An instance of an XML schema is an XML schema document and is a file with the extension .xsd.
- XML Document: An XML document is a file containing data organized into a structured document using XML markup. An XML document is considered to be "well-formed" if it conforms to all XML syntax rules. An XML document is considered to be "valid" if it conforms to all the semantic rules defined by an associated XML schema. An XML document cannot be processed if it is not well-formed or valid. XML documents have the file extension .xml.
- XML Element: An XML element is a unit of the XML document that is expressed as tags in the form "<tagname>." XML elements must have either a start and end tag as in <ghg:GHGasInfoDetails> </ghg:GHGasInfoDetails> or a single empty tag name as in <ghg:GHGasInfoDetails/>. XML elements may be nested within one another in a structured hierarchy and sequence specified in an XML schema.
- XML Attribute: An XML attribute contains additional information about an XML element placed at the start tag of the XML element. XML attributes have the form attributeName = "attributeValue," as in <ghg:GHGasQuantity massUOM="Metric Tons">. XML attributes are used to report identifying information or to help e-GGRT process the data being reported within the data elements.

Rounded results from calculated values should be reported in the XML schema. Please use the following rounding rules:

1) CO_2e and CO_2 emissions data expressed in metric tons should be rounded to one decimal place. This should be done regardless of the level of data collection (e.g., unit-level, facility-level). Quantities less than 0.05 metric tons would round to 0.0 and be reported as such. Quantities greater than or equal to 0.05 metric tons would round up to 0.1 and be reported as such.
2) CH_4 emissions data expressed in metric tons should be rounded to two decimal places.
3) N_2O emissions data expressed in metric tons should be rounded to three decimal places.
4) Emissions data for all GHGs other than CO_2, N_2O, and CH_4 expressed in metric tons should be rounded to the fourth digit to the right of the decimal (one tenth of a kilogram, or 1 ten thousandth of a metric ton). This rounding should be applied regardless of the level of data collection (unit, facility, etc.).
5) Other (non-emissions) quantitative data reported by the user (e.g., a monthly HHV sample result, an annual production quantity) will not need to be rounded.
6) In the case of aggregation/roll-ups, those calculations should be performed on the rounded values.

Figure 4
Subpart X Schema Diagram

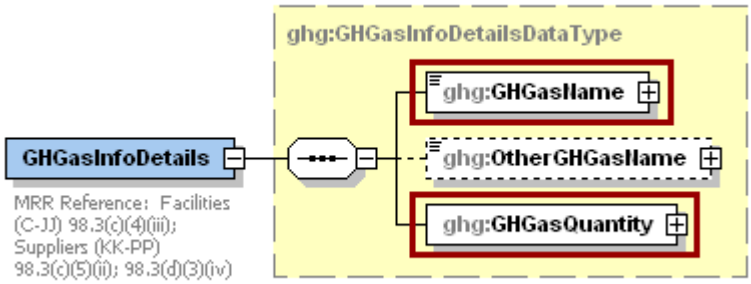


Note: If you are using a Best Available Monitoring Method (BAMM) in accordance with the rule in place of a method in Subpart X, report "Other (specify)" for the relevant data element and report "BAMM" for the corresponding "Other" data element. Details regarding BAMM methods used should be included in Subpart A.

1.0 Subpart X Total Emissions

Greenhouse gas information details comprise a collection of data elements to report the total annual emissions of each greenhouse gas (GHG) listed in Table A-1 of the Mandatory Reporting of GHG, Part 98 reported under Subpart X, expressed in metric tons.

Figure 5
Greenhouse Gas Information Details Schema Diagram



For Subpart X, report total emissions for carbon dioxide (excluding biogenic CO_2), biogenic CO_2, methane (CH_4) and nitrous oxide (N_2O) using the following guidelines.

1) Total CO_2 emissions (excluding biogenic CO_2):
   - Add the total annual CO_2 mass emissions measured by the CEMS for each CEMS monitoring location (CML) in metric tons rounded to one decimal place. Then subtract the total annual biogenic CO_2 emissions for each CML in metric tons rounded to one decimal place.
   - Add the annual CO_2 mass emissions from process operations and process off-gas combustion for each unit in metric tons rounded to one decimal place.
   - Add the annual CO_2 mass emissions from each flare in metric tons rounded to one decimal place.
2) Total biogenic CO_2 emissions: Add the total annual biogenic CO_2 mass emissions in metric tons rounded to one decimal place for each CML.
3) Total CH_4 emissions: Add the total CH_4 emissions in metric tons rounded to two decimal places for each CML and from each flare.
4) Total N_2O emissions: Add the total N_2O emissions in metric tons rounded to three decimal places for each CML and from each flare.

For greenhouse gas quantity, report the calculated value and mass unit of measure (Metric Tons) only.

Table 1
Greenhouse Gas Information Details XML Data Elements

Data Element Name	Description
GHGasInfoDetails	A collection of data elements containing the total annual emissions of each greenhouse gas (GHG) listed in Table A-1 of the Mandatory Reporting of GHGs, Part 98 reported under this subpart, expressed in metric tons.
GHGasName	Specify the name of the GHG. See list of allowable values: Carbon Dioxide Biogenic Carbon dioxide Methane Nitrous Oxide
GHGasQuantity	A collection of data elements that quantify the annual emissions from this facility category. Report the calculated value only using the guidelines above.
GHGasQuantity.massUOM	Metric Tons

Figure 6
Sample XML Excerpt for Greenhouse Gas Information Details

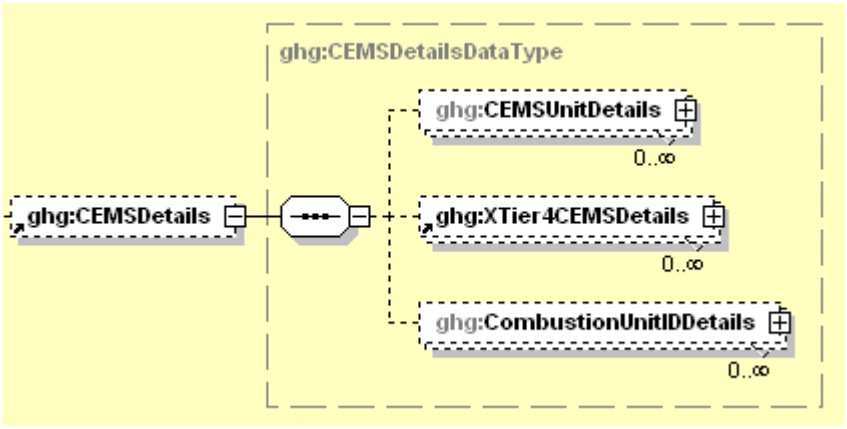
```
<ghg:SubPartX>
        <ghg:GHGasInfoDetails>
                <ghg:GHGasName>Biogenic Carbon dioxide</ghg:GHGasName>
                <ghg:GHGasQuantity massUOM="Metric Tons">
                        <ghg:CalculatedValue>600</ghg:CalculatedValue>
                </ghg:GHGasQuantity>
        </ghg:GHGasInfoDetails>
        <ghg:GHGasInfoDetails>
                <ghg:GHGasName>Methane</ghg:GHGasName>
                <ghg:GHGasQuantity massUOM="Metric Tons">
                        <ghg:CalculatedValue>280</ghg:CalculatedValue>
                </ghg:GHGasQuantity>
        </ghg:GHGasInfoDetails>
        <ghg:GHGasInfoDetails>
                <ghg:GHGasName>Nitrous Oxide</ghg:GHGasName>
                <ghg:GHGasQuantity massUOM="Metric Tons">
                        <ghg:CalculatedValue>19</ghg:CalculatedValue>
                </ghg:GHGasQuantity>
        </ghg:GHGasInfoDetails>
        <ghg:GHGasInfoDetails>
                <ghg:GHGasName>Carbon Dioxide</ghg:GHGasName>
                <ghg:GHGasQuantity massUOM="Metric Tons">
                        <ghg:CalculatedValue>10800</ghg:CalculatedValue>
                </ghg:GHGasQuantity>
        </ghg:GHGasInfoDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

2.0 CEMS Methodology Details

This section describes information which must be reported if a continuous emissions monitoring system (CEMS) was in use during the reporting year (CEMS methodology of 98.243(b)). This method must be used if all process vent emissions and emissions from combustion of process off-gas is routed to one or more stacks and CEMS is used on each stack (except flare stacks) to measure CO_2 emissions.

Figure 7
CEMS Details Schema Diagram



Subpart X requires the following identification information for each petrochemical process unit that had emissions monitored using a CEMS:

- A unique unit name or identifier (e.g., a unit ID number).
- An optional unit description or label.
- A code representing the type of unit: "Petrochemical process unit".

For each petrochemical process unit, the facility must provide the following:

- The type of petrochemical produced from the following list [98.246(b)(1)]:
    - Methanol
    - Carbon Black
    - Acrylonitrile
    - Ethylene dichloride
    - Ethylene oxide
    - Ethylene

- The annual quantity of the petrochemical produced in metric tons [98.246 (b)(8)].

Figure 8
CEMS Unit Details Schema Diagram

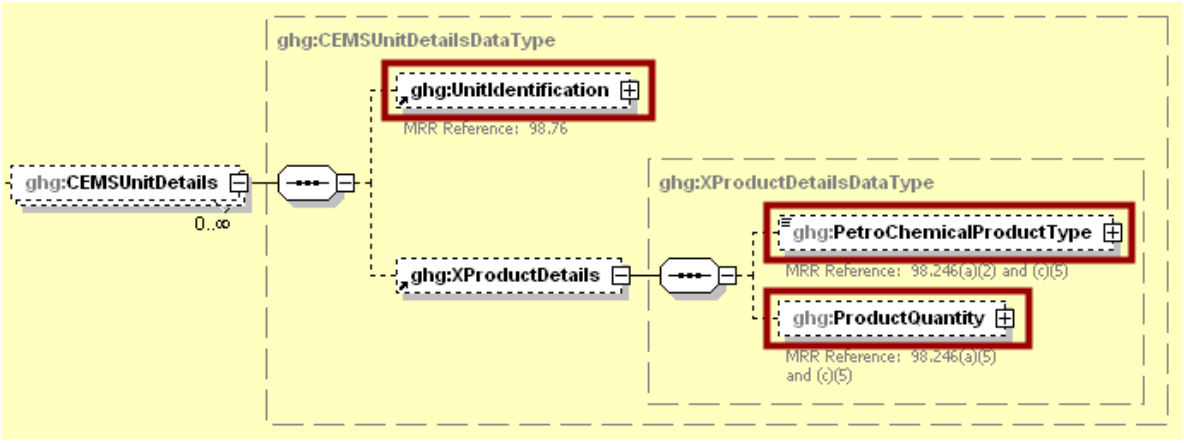


Table 2
CEMS Unit Details XML Data Elements

Data Element Name	Description
CEMSDetails	A collection of data elements containing details about units which were monitored using a CEMS.
CEMSUnitDetails	A collection of data elements containing details about each unit which was monitored using a CEMS.
UnitIdentification	A collection of data elements containing the identity of each petrochemical process unit monitored by CEMS. It includes the unit ID, an optional brief description, and the unit type: "Petrochemical process unit".
XProductDetails	A collection of data elements containing information about the petrochemical produced by the specified unit.
PetroChemicalProductType	Type of petrochemical produced by the specified unit. See list of allowable values: Methanol Carbon Black Acrylonitrile Ethylene dichloride Ethylene oxide Ethylene
ProductQuantity	A collection of data elements containing information on the annual quantity of the petrochemical produced by the specified unit. Report the measured value only.
ProductQuantity.massUOM	Metric Tons

Figure 9
Sample XML Excerpt for CEMS Unit Details

```
<ghg:CEMSDetails>
    <ghg:CEMSUnitDetails>
        <ghg:UnitIdentification>
            <ghg:UnitName>001-CEMS</ghg:UnitName>
            <ghg:UnitDescription>CEMS unit</ghg:UnitDescription>
            <ghg:UnitType>Petrochemical process unit</ghg:UnitType>
        </ghg:UnitIdentification>
        <ghg:XProductDetails>
            <ghg:PetroChemicalProductType>Methanol</ghg:PetroChemicalP
            roductType>
            <ghg:ProductQuantity massUOM="Metric Tons">
                <ghg:MeasureValue>1000</ghg:MeasureValue>
            </ghg:ProductQuantity>
        </ghg:XProductDetails>
    </ghg:CEMSUnitDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 10
Tier 4 CEMS Details Schema Diagram

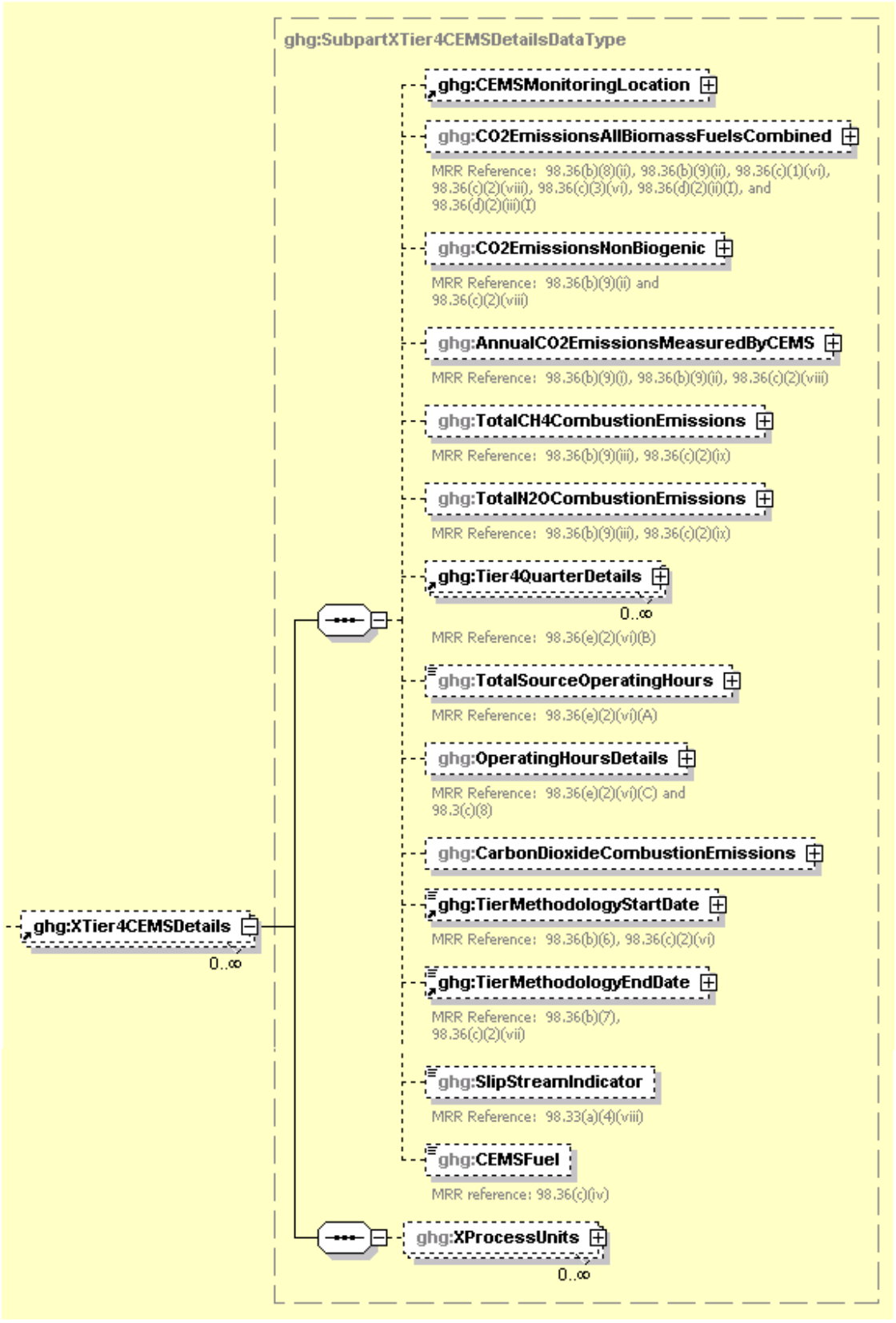


Figure 11
Tier 4 CEMS Monitoring Location and Emissions Schema Diagram

For subpart X, information on each CEMS monitoring location (CML) is required including:

- A unique unit name or identifier for the CML.
- An optional description or label for the CML.
- The configuration of processes or process units that are monitored by the CML from the following list:

    - Single industrial process or process unit that exhausts to a dedicated stack.
    - Multiple industrial processes or process units share a common stack.
    - Industrial process or process unit shares a common stack with one or more stationary fuel combustion units.

For each CEMS monitoring location identified, the following emissions data must be reported:

- The total annual CO_2 emissions from the combustion of all biomass fuels combined if biomass fuels are combusted in the configuration [98.36(b)(8)(ii)].
- The total annual non-biogenic CO_2 emissions (i.e. CO_2 emissions from fossil fuels, sorbent use, and process CO_2 emissions) [98.36(b)(9)(ii)].
- The total annual CO_2 emissions measured by the CEMS [98.36(b)(9)(i)-(ii)].
- The total annual CH_4 emissions associated with the combustion of all Table C-2 fuels combusted in all processes/process units monitored by the CEMS derived from application of Equation C-10 [98.36(b)(9)(iii), 98.36(c)(2)(ix)].
- The total annual N_2O emissions associated with the combustion of all Table C-2 fuels combusted in all processes/process units monitored by the CEMS derived from application of Equation C-10 [98.36(b)(9)(iii), 98.36(c)(2)(ix)].

Table 3
Tier 4 CEMS Monitoring Location and Emissions XML Data Elements

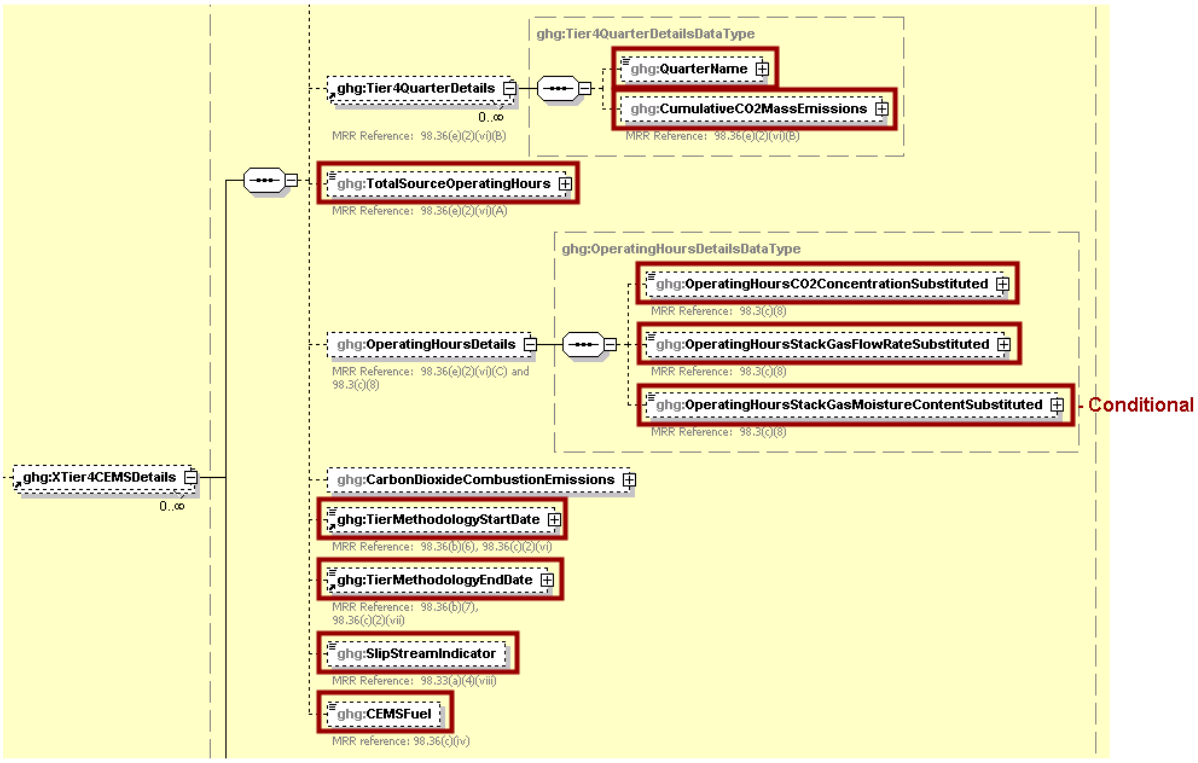
Data Element Name	Description
XTier4CEMSDetails	A collection of data elements containing information about each CEMS monitoring location.
CEMSMonitoringLocation	A collection of data elements containing the identity of each CEMS monitoring location. It includes the location's name, an optional description, and the configuration type. See the list of allowable configuration types: Single process/process unit exhausts to dedicated stack Multiple processes/process units share common stack Process/stationary combustion units share common stack
CO2EmissionsAllBiomassFuelsCombined	A collection of data elements containing information on the total annual biogenic CO_2 emissions for the specified CEMS monitoring location. Report the calculated value only.
CO2EmissionsAllBiomassFuelsCombined.massUOM	Metric Tons
CO2EmissionsNonBiogenic	A collection of data elements containing information on the total annual non-biogenic CO_2 emissions for the specified CEMS monitoring location. Report the calculated value only.
CO2EmissionsNonBiogenic.massUOM	Metric Tons
AnnualCO2EmissionsMeasuredByCEMS	A collection of data elements containing information on the total annual CO_2 emissions measured by the CEMS at the specified CEMS monitoring location. Report the calculated value only.
AnnualCO2EmissionsMeasuredByCEMS.massUOM	Metric Tons
TotalCH4CombustionEmissions	A collection of data elements containing information on the annual CH_4 emissions at the specified CEMS monitoring location during the reporting year calculated using Equation C-10 expressed in mass of CH_4. Report the calculated value only.
TotalCH4CombustionEmissions.massUOM	Metric Tons
TotalN2OCombustionEmissions	A collection of data elements containing information on the annual N_2O emissions at the specified CEMS monitoring location during the reporting year calculated using Equation C-10 expressed in mass of N_2O. Report the calculated value only.
TotalN2OCombustionEmissions.massUOM	Metric Tons

Figure 12
Sample XML Excerpt for Tier 4 CEMS Monitoring Location and Emissions

```
<ghg:XTier4CEMSDetails>
    <ghg:CEMSMonitoringLocation>
        <ghg:Name>005- CML</ghg:Name>
        <ghg:Description>CML</ghg:Description>
        <ghg:Type>Single process/process unit exhausts to dedicated
        stack</ghg:Type>
    </ghg:CEMSMonitoringLocation>
    <ghg:CO2EmissionsAllBiomassFuelsCombined massUOM="Metric Tons">
        <ghg:CalculatedValue>600</ghg:CalculatedValue>
    </ghg:CO2EmissionsAllBiomassFuelsCombined>
    <ghg:CO2EmissionsNonBiogenic massUOM="Metric Tons">
        <ghg:CalculatedValue>700</ghg:CalculatedValue>
    </ghg:CO2EmissionsNonBiogenic>
    <ghg:AnnualCO2EmissionsMeasuredByCEMS massUOM="Metric Tons">
        <ghg:CalculatedValue>1500</ghg:CalculatedValue>
    </ghg:AnnualCO2EmissionsMeasuredByCEMS>
    <ghg:TotalCH4CombustionEmissions massUOM="Metric Tons">
        <ghg:CalculatedValue>80</ghg:CalculatedValue>
    </ghg:TotalCH4CombustionEmissions>
    <ghg:TotalN2OCombustionEmissions massUOM="Metric Tons">
        <ghg:CalculatedValue>9</ghg:CalculatedValue>
    </ghg:TotalN2OCombustionEmissions>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 13
Tier 4 CEMS Quarterly and Operating Hours Details Schema Diagram



For each quarter of the reporting year, the facility must provide the cumulative CO_2 mass emissions for each CML [98.36(e)(2)(vi)(B)].

The facility must provide the following additional information for each CML:

- The total number of source operating hours in the reporting year [98.36(e)(2)(vi)(A)]

- The total operating hours in which a substitute data value was used in the emissions calculations for the CO_2 concentration parameter [98.36(e)(2)(vi)(C) and 98.3(c)(8)]
- The total operating hours in which a substitute data value was used in the emissions calculations for the stack gas flow rate parameter [98.36(e)(2)(vi)(C) and 98.3(c)(8)]
- If moisture correction is required and a continuous moisture monitor is used, the total operating hours in which a substitute data value was used in the emissions calculations for the stack gas moisture content parameter [98.36(e)(2)(vi)(C) and 98.3(c)(8)]
- The Tier 4 methodology start date [98.36(b)(6), 98.36(c)(2)(vi)]
- The Tier 4 methodology end date [98.36(b)(7), 98.36(c)(2)(vii)]
- Specify if emissions reported for the CEMS include emissions calculated according to 98.33(a)(4)(viii) for a slipstream that bypassed the CEMS [98.33(a)(4)(viii)]
- Each type of fuel combusted in the group of units during the reporting year [98.36(c)(1)(v)]

Table 4
Tier 4 CEMS Quarterly and Operating Hours Details XML Data Elements

Data Element Name	Description
Tier4QuarterDetails	A collection of data elements which must be reported on a quarterly basis.
QuarterName	The name of the quarter. See list of allowable values: First Quarter Second Quarter Third Quarter Fourth Quarter
CumulativeCO2MassEmissions	A collection of data elements containing information on the cumulative CO_2 mass emissions for the specified CEMS monitoring location for the specified quarter of the reporting year. Report the calculated value only.
CumulativeCO2MassEmissions.massUOM	Metric Tons
TotalSourceOperatingHours	The total number of source operating hours in the reporting year for the specified CEMS monitoring location.
OperatingHoursDetails	A collection of data elements containing information on substitute data values.
OperatingHoursCO2ConcentrationSubstituted	The total operating hours in which a substitute data value was used in the emissions calculations for the CO_2 concentration parameter at the specified CEMS monitoring location.
OperatingHoursStackGasFlowRateSubstituted	The total operating hours in which a substitute data value was used in the emissions calculations for the stack gas flow rate parameter at the specified CEMS monitoring location.

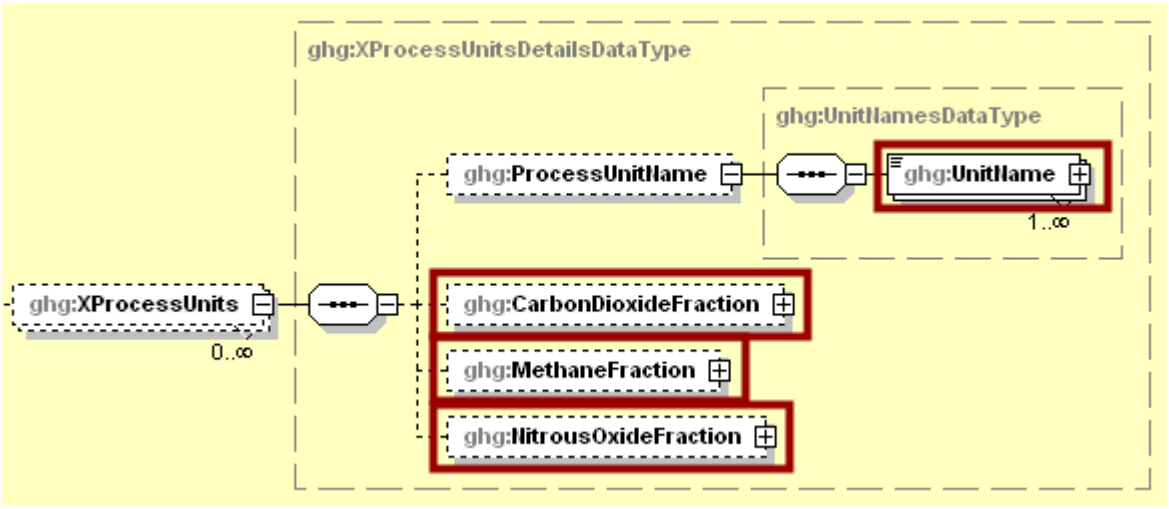
Data Element Name	Description
OperatingHoursStackGasMoistureContentSubstituted	If moisture correction is required and a continuous moisture monitor is used, the total operating hours in which a substitute data value was used in the emissions calculations for the stack gas moisture content parameter at the specified CEMS monitoring location.
TierMethodologyStartDate	The tier methodology start date for the specified CEMS monitoring location.
TierMethodologyEndDate	The tier methodology end date for the specified CEMS monitoring location.
SlipStreamIndicator	An indication (Y/N) that the emissions reported for the CEMS include emissions calculated according to 98.33(a)(4)(viii) for a slipstream that bypassed the CEMS.
CEMSFuel	Each type of fuel combusted in the group of units during the reporting year.

Figure 14
Sample XML Excerpt for Tier 4 CEMS Quarterly and Operating Hours Details

```
<ghg:Tier4QuarterDetails>
        <ghg:QuarterName>First Quarter</ghg:QuarterName>
        <ghg:CumulativeCO2MassEmissions massUOM="Metric Tons">
                <ghg:CalculatedValue>100</ghg:CalculatedValue>
        </ghg:CumulativeCO2MassEmissions>
</ghg:Tier4QuarterDetails>
<ghg:Tier4QuarterDetails>
        <ghg:QuarterName>Second Quarter</ghg:QuarterName>
        <ghg:CumulativeCO2MassEmissions massUOM="Metric Tons">
                <ghg:CalculatedValue>200</ghg:CalculatedValue>
        </ghg:CumulativeCO2MassEmissions>
</ghg:Tier4QuarterDetails>
<ghg:Tier4QuarterDetails>
        <ghg:QuarterName>Third Quarter</ghg:QuarterName>
        <ghg:CumulativeCO2MassEmissions massUOM="Metric Tons">
                <ghg:CalculatedValue>300</ghg:CalculatedValue>
        </ghg:CumulativeCO2MassEmissions>
</ghg:Tier4QuarterDetails>
<ghg:Tier4QuarterDetails>
        <ghg:QuarterName>Fourth Quarter</ghg:QuarterName>
        <ghg:CumulativeCO2MassEmissions massUOM="Metric Tons">
                <ghg:CalculatedValue>400</ghg:CalculatedValue>
        </ghg:CumulativeCO2MassEmissions>
</ghg:Tier4QuarterDetails>
<ghg:TotalSourceOperatingHours>8000</ghg:TotalSourceOperatingHours
>
<ghg:OperatingHoursDetails>
        <ghg:OperatingHoursCO2ConcentrationSubstituted>10</ghg:Op
        eratingHoursCO2ConcentrationSubstituted>
        <ghg:OperatingHoursStackGasFlowRateSubstituted>20</ghg:Op
        eratingHoursStackGasFlowRateSubstituted>
        <ghg:OperatingHoursStackGasMoistureContentSubstituted>30</
        ghg:OperatingHoursStackGasMoistureContentSubstituted>
</ghg:OperatingHoursDetails>
<ghg:TierMethodologyStartDate>2010-01-
01</ghg:TierMethodologyStartDate>
<ghg:TierMethodologyEndDate>2010-12-
31</ghg:TierMethodologyEndDate>
<ghg:SlipStreamIndicator>Y</ghg:SlipStreamIndicator>
<ghg:CEMSFuel>coal, coke, natural gas</ghg:CEMSFuel>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 15
Tier 4 CEMS Process Units Details Schema Diagram



For each CML that is monitoring a Subpart X petrochemical process unit, report the following for each process unit:

- The name/ID of each process unit monitored at the CML.
- The fraction of the carbon dioxide emissions from the CML that are attributable to combustion of the off-gas from the petrochemical process unit [98.246(b)(4)].
- The fraction of the calculated methane emissions from the CML that are attributable to combustion of the off-gas from the petrochemical process unit [98.246(b)(5)(i))].
- The faction of the calculated nitrous oxide emissions from the CML that are attributable to combustion of the off-gas from the petrochemical process unit [98.246(b)(5)(i)].

Table 5
Tier 4 CEMS Process Units Details XML Data Elements

Data Element Name	Description
XProcessUnits	A collection of data elements for process units monitored at the specified CEMS monitoring location.
ProcessUnitName	A collection of data elements for each process unit monitored at the specified CEMS monitoring location.
UnitName	The name of each process unit that is monitored at the specified CEMS monitoring location (CML). Use the exact unit name(s) as for "UnitIdentification". Report each unit separately.
CarbonDioxideFraction	Fraction of CO_2 emissions from the CML attributable to combustion of the off-gas from the specified petrochemical process unit.
CarbonDioxideFraction.fractionUOM	decimal fraction

Data Element Name	Description
MethaneFraction	Fraction of CH_4 emissions from the CML attributable to combustion of the off-gas from the specified petrochemical process unit.
MethaneFraction.fractionUOM	decimal fraction
NitrousOxideFraction	Fraction of N_2O emissions from the CML attributable to combustion of the off-gas from the specified petrochemical process unit.
NitrousOxideFraction.fractionUOM	decimal fraction

Figure 16
Sample XML Excerpt for Tier 4 CEMS Process Units Details

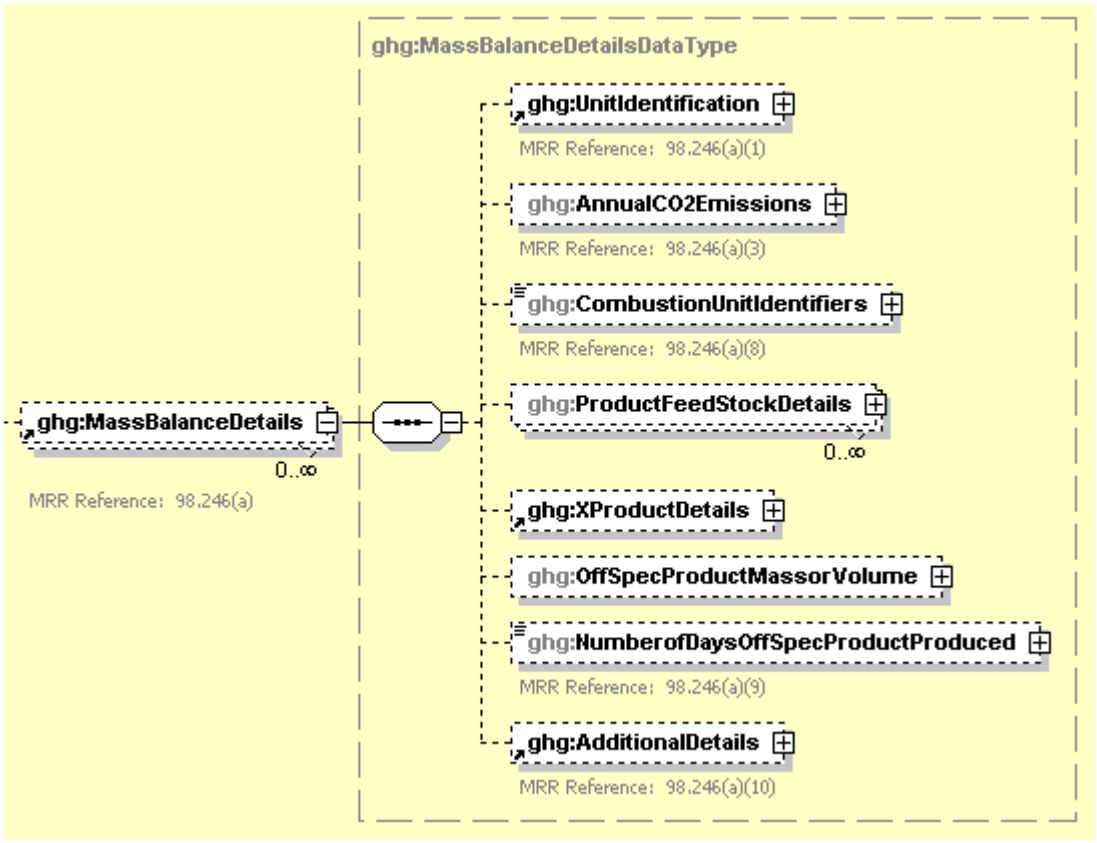
```
<ghg:XProcessUnits>
    <ghg:ProcessUnitName>
        <ghg:UnitName>001-CEMS</ghg:UnitName>
    </ghg:ProcessUnitName>
    <ghg:CarbonDioxideFraction fractionUOM="decimal fraction">
        <ghg:MeasureValue>0.05</ghg:MeasureValue>
    </ghg:CarbonDioxideFraction>
    <ghg:MethaneFraction fractionUOM="decimal fraction">
        <ghg:MeasureValue>0.07</ghg:MeasureValue>
    </ghg:MethaneFraction>
    <ghg:NitrousOxideFraction fractionUOM="decimal fraction">
        <ghg:MeasureValue>0.06</ghg:MeasureValue>
    </ghg:NitrousOxideFraction>
</ghg:XProcessUnits>
</ghg:XTier4CEMSDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

3.0 Mass Balance Methodology Details

This section describes information which must be reported for each petrochemical process unit for which the mass balance methodology of 98.243(c) was used. This method must be used if the total emissions from process vents and emissions from combustion of process off-gas are not routed to stacks that are monitored with CEMS (except flare stacks) to measure CO_2 emissions and the unit is not producing ethylene.

Figure 17
Mass Balance Methodology Schema Diagram



Subpart X requires the following identification information for each petrochemical process unit for which the mass balance methodology of 98.243(c) was used:

- A unique unit name or identifier (e.g., a unit ID number).
- An optional unit description or label.
- A code representing the type of unit: "Petrochemical process unit".

Report the annual CO_2 mass emissions for each petrochemical process unit (the output of Equation X-4) [98.246(a)(3)]. Process emissions include CO_2 generated by reaction in the process and by combustion of process off-gas in stationary combustion units and flares.

For each petrochemical process unit, identify each combustion configuration that burned both process off-gas from the petrochemical process unit and supplemental fuel by providing the name/identifier of the combustion configuration as reported under subpart C [98.246(a)(8)].

Figure 18
Unit Identification and Emissions Schema Diagram

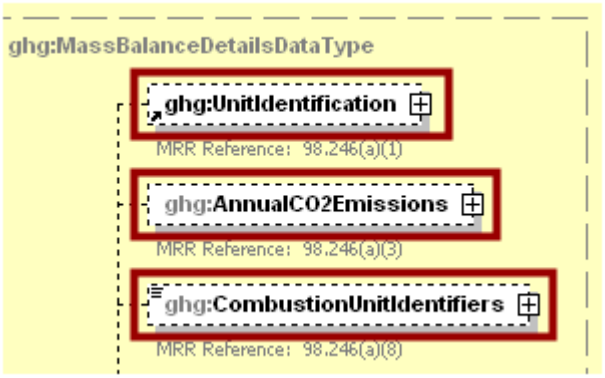


Table 6
Unit Identification and Emissions XML Data Elements

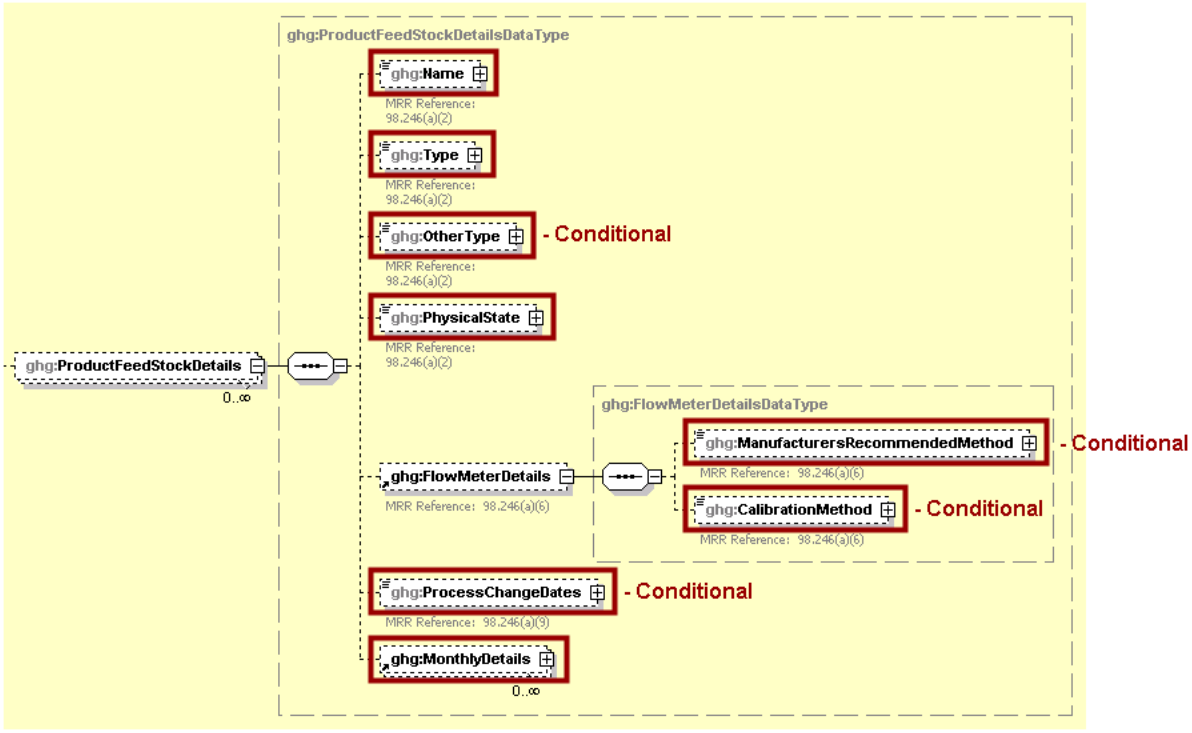
Data Element Name	Description
MassBalanceDetails	A collection of data elements containing information on each unit for which the mass balance methodology was used to monitor emissions.
UnitIdentification	A collection of data elements containing the identity of a petrochemical process unit. It includes the unit name, an optional brief description, and the unit type: "Petrochemical process unit".
AnnualCO2Emissions	A collection of data elements containing information on annual CO_2 mass emissions from process operations and process off-gas combustion from the specified unit calculated using Equation X-4. Report the calculated value only.
AnnualCO2Emissions.massUOM	Metric Tons
CombustionUnitIdentifiers	Identify each combustion configuration that burned both process off-gas from the petrochemical process unit and supplemental fuel by providing the name/identifier of those configurations as reported under Subpart C. If there aren't any, specify "None".

Figure 19
Sample XML Excerpt for Unit Identification and Emissions

```
<ghg:MassBalanceDetails>
    <ghg:UnitIdentification>
        <ghg:UnitName>002- Mass</ghg:UnitName>
        <ghg:UnitDescription>Mass unit</ghg:UnitDescription>
        <ghg:UnitType>Petrochemical process unit</ghg:UnitType>
    </ghg:UnitIdentification>
    <ghg:AnnualCO2Emissions massUOM="Metric Tons">
        <ghg:CalculatedValue>9000.0</ghg:CalculatedValue>
    </ghg:AnnualCO2Emissions>
    <ghg:CombustionUnitIdentifiers>None</ghg:CombustionUnitIdentifiers>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 20
Product and Feedstock Details Schema Diagram



For each petrochemical process unit for which the facility specified the mass balance methodology, provide the following:

- The type of each carbon-containing feedstock to the petrochemical process unit [98.246(a)(2)].
- The type of petrochemical produced [98.246(a)(2)].
- The type of each other carbon-containing product of the petrochemical process unit [98.246(a)(2)].
- An indication of whether each carbon-containing feedstock, petrochemical product, and other carbon-containing product were solid, liquid, or gaseous.

If a flow meter was used at any point during the year to measure the mass or volume of the feedstock or product, provide the following:

- A description of the manufacturer's recommended method for operation [98.246(a)(6)].
- A description of the flow meter's calibration method [98.246(a)(6)].

For each feedstock or product for which the facility used the alternative to sampling method specified in 98.243(c)(4), report the date of each process change that reduced the composition to less than 99.5 percent [98.246(a)(9)].

Table 7
Product and Feedstock Details XML Data Elements

Data Element Name	Description
ProductFeedStockDetails	A collection of data elements containing information on each carbon-containing feedstock for and product of the specified unit.
Name	Name of each carbon-containing feedstock and each carbon-containing product of the specified process unit (both the petrochemical and any other carbon-containing byproducts and liquid organic wastes).
Type	The type of the specified carbon-containing feedstock and each carbon-containing product of the specified process unit (both the petrochemical and any other carbon-containing byproducts and liquid organic wastes). See list of allowable values: Methanol Carbon Black Ethylene dichloride Ethylene oxide Propane Natural gas Coal Carbon Black Oil Ethylene Ethane Butane Naphtha Gas oil Natural Gas Liquids Acetonitrile Hydrogen Cyanide Carbon Dioxide Propylene Polypropylene Ethanol Benzene Heavy Gasoline Other
OtherType	The type of the specified carbon-containing feedstock or product if "Other" was reported for Type.
PhysicalState	The state of the specified carbon-containing feedstock or product. See list of allowable values: Solid Liquid Gaseous
FlowMeterDetails	A collection of data elements containing flow meter information.
ManufacturersRecommendedMethod	For liquid or gaseous feedstocks and products, if a flow meter was used at any point during the year to measure the mass or volume, describe the flow meter manufacturer's recommended method for operation.

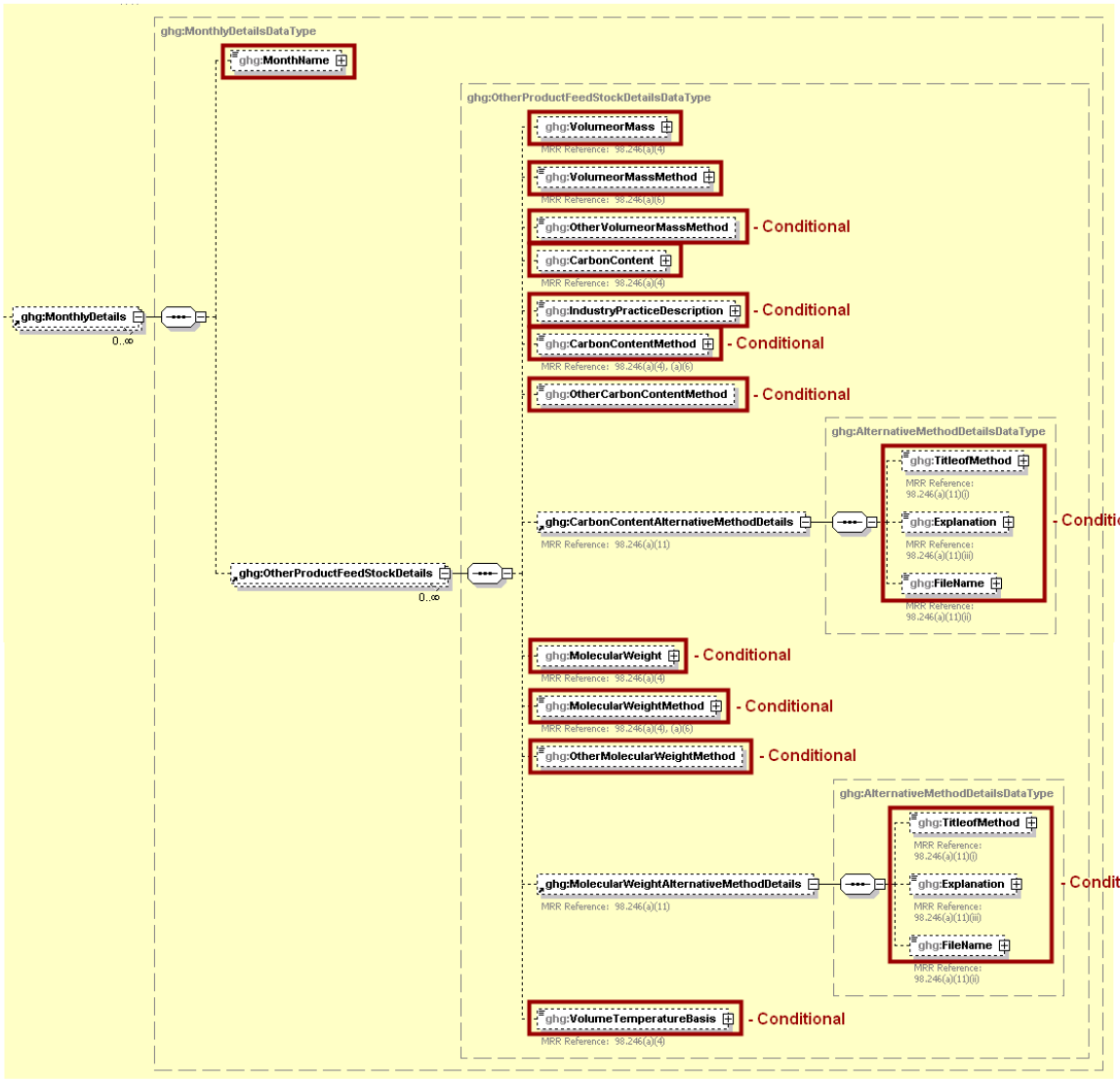
Data Element Name	Description
CalibrationMethod	For liquid or gaseous feedstocks and products, if a flow meter was used at any point during the year to measure the mass or volume, describe the flow meter's calibration method. If the flow meter used does not require calibration per the manufacturer's instructions, then state that calibration is not required.
ProcessChangeDates	If you comply with the alternative to sampling and analysis specified in §98.243(c)(4) and if applicable, report the dates for each process change that reduced the composition of the specified feedstock or product to less than 99.5% of the specific compound.

Figure 21
Sample XML Excerpt for Product and Feedstock Details

```
<ghg:ProductFeedStockDetails>
        <ghg:Name>Natural gas</ghg:Name>
        <ghg:Type>Natural gas</ghg:Type>
        <ghg:PhysicalState>Gaseous</ghg:PhysicalState>
        <ghg:FlowMeterDetails>
                <ghg:ManufacturersRecommendedMethod>Description
                A</ghg:ManufacturersRecommendedMethod>
                <ghg:CalibrationMethod>Description
                B</ghg:CalibrationMethod>
        </ghg:FlowMeterDetails>
        <ghg:ProcessChangeDates>1/2/2010</ghg:ProcessChangeDates>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 22
Product and Feedstock Monthly Details Schema Diagram



For each process unit and for each solid, liquid, and gaseous carbon-containing feedstock or product the system and for each month, report the following:

- An indication as to whether the volume (gaseous and liquid) or mass (solid or liquid) was based on a missing data procedure described in §98.245 [98.3(c)(8)].
- The §98.244 method used to measure volume or mass [98.246(a)(6)].
- An indication as to whether the carbon content or composition was based on a missing data procedure described in §98.245 [98.3(c)(8)].
- If the method used to determine the carbon content or composition is the industry standard practice for carbon black, specify the practice.
- The method used to determine the carbon content or composition [98.246(a)(4) and 98.246(a)(6)].

For each process unit and for each solid, liquid, and gaseous carbon-containing feedstock or product for which the facility specified that the carbon content or composition was determined using the §98.244(b)(4)(xv)(B) alternative method, report the following:

- The name or title of the method [98.246(a)(11)(i)].
- An explanation of why an alternative to the methods listed in 98.244(b)(4)(i) through (xiii) was needed [98.246(a)(11)(iii)].
- The filename of the copy of the alternative method. Include a copy of the method in Word or PDF format in the ZIP file uploaded to e-GGRT [98.246(a)(11)(ii)].

For each process unit and for each gaseous carbon-containing feedstock or product and for each month, report the following:

- An indication as to whether the molecular weight was based on a missing data procedure described in §98.245 [98.3(c)(8)].
- The method used to determine the molecular weight [98.246(a)(4) and 98.246(a)(6)].

For each process unit and for each gaseous carbon-containing feedstock or product for which the facility specified that the molecular weight was determined using the §98.244(b)(4)(xv)(B) alternative method, report the following:

- The name or title of the method [98.246(a)(11)(i)].
- An explanation of why an alternative to the methods listed in 98.244(b)(4)(i) through (xiii) was needed [98.246(a)(11)(iii)].
- The filename of the copy of the alternative method. Include a copy of the method in Word or PDF format in the ZIP file uploaded to e-GGRT [98.246(a)(11)(ii)].

For each process unit and for each gaseous carbon-containing feedstock or product and for each month, report whether volume was measured at 60 degrees Fahrenheit or 68 degrees Fahrenheit [98.246(a)(4)].

Table 8
Product and Feedstock Monthly Details XML Data Elements

Data Element Name	Description
MonthlyDetails	A collection of data elements which must be reported on a monthly basis.
MonthName	Month name. See list of allowable values: January February March April May June July August September October November December
OtherProductFeedStockDetails	A collection of data elements containing additional information on the specified feedstock or product.

Data Element Name	Description
VolumeorMass	Indicate (Y/N) whether the volume (gaseous and liquid) or mass (solid or liquid) for the feedstock or product and month specified was based on a missing data procedure described in §98.245.
VolumeorMassMethod	Report the §98.244 method used to measure volume or mass. Report "Flow meter" for gaseous, "Weighing device" for solid, and any of the options for liquid feedstock or product. See list of allowable values: Flow meter Tank level measurements Weighing device Other (specify)
OtherVolumeorMassMethod	Report the method used to measure volume or mass if "Other (specify)" was reported above.
CarbonContent	Indicate (Y/N) whether the carbon content or composition for the feedstock or product and month specified was based on a missing data procedure described in §98.245. Report "N" if you used the alternative sampling and analysis option in §98.243(c)(4).
IndustryPracticeDescription	If you report CarbonContentMethod (below) as "Industry standard practice for carbon black", specify the practice.
CarbonContentMethod	Report the method listed in §98.244 used to determine the carbon content. See list of allowable values: ASTM D1945-03 ASTM D6060-96 (Reapproved 2001) ASTM D2505-88 (Reapproved 2004) ASTM UOP539-97 ASTM D3176-89 (Reapproved 2002) ASTM D5291-02 (Reapproved 2007) ASTM D5373-08 SW-846 Method 8015C SW-846 Method 8021B SW-846 Method 8031 SW-846 Method 9060A Method 18, 40 CFR 60, appendix A-6 Performance Spec 9, 40 CFR 60, App B ASTM D2593-93 (Reapproved 2009) ASTM D7633-10 Chromatographic analysis Mass spectrometer analysis Industry standard practice for carbon black 98.244(b)(4)(xv)(B) alternative method Other (specify) Do not report this data element if you complied with the alternative sampling and analysis option in §98.243(c)(4) for the specified feedstock.
OtherCarbonContentMethod	Report the method used to determine the carbon content if "Other (specify)" was reported above.
CarbonContentAlternativeMethodDetails	A collection of data elements to report if CarbonContentMethod is "98.244(b)(4)(xv)(B) alternative method".
TitleofMethod	Name or title of the carbon content determination alternative method.

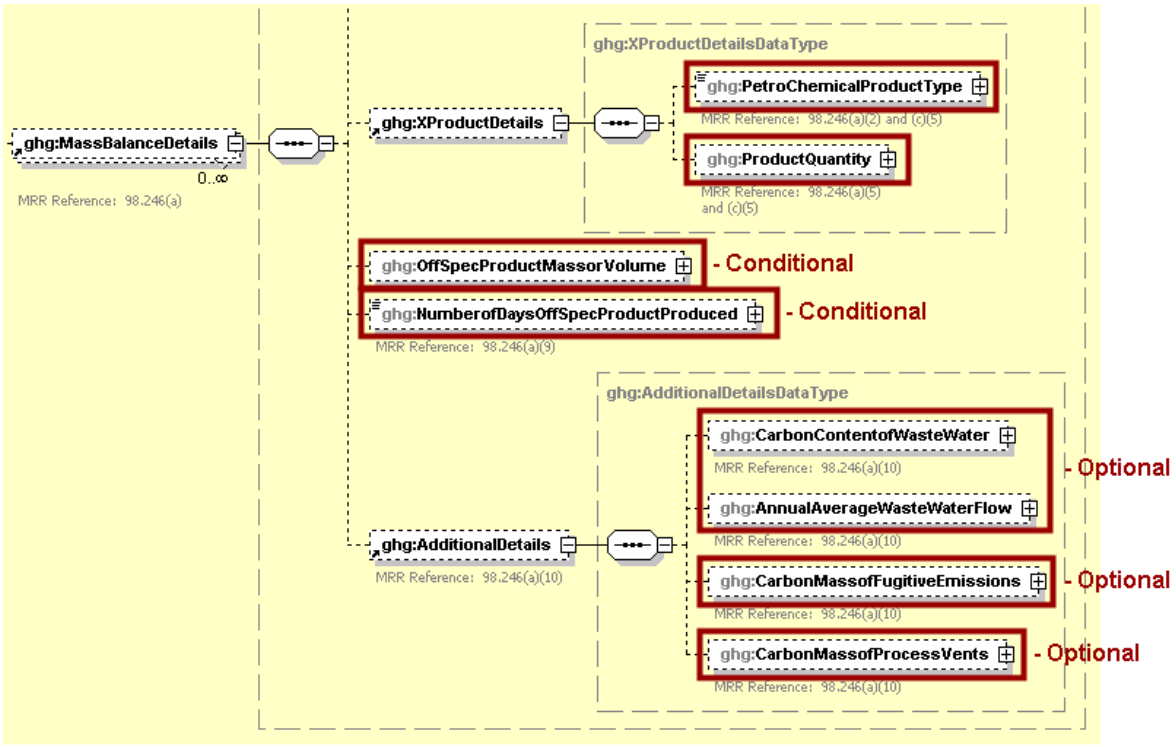
Data Element Name	Description
Explanation	An explanation of why an alternative to the methods listed in 98.244(b)(4)(i) through (xiv) was needed.
FileName	File name of the copy of the alternative method. If the method is a modification of a method listed in §98.244(b)(4)(i) through (xiv), you may provide a copy of only the sections that differ from the listed method. Include a copy of the file in Word or PDF format in the ZIP file uploaded to e-GGRT.
MolecularWeight	If the specified feedstock or product is gaseous, an indication (Y/N) as to whether the molecular weight was based on a missing data procedure described in §98.245. Note that measurement of the molecular weight of the feedstock stream (i.e., the average molecular weight) is not needed if you measure the composition. In such cases, use the known molecular weights of the identified compounds in the stream, and report "N" for this data element.
MolecularWeightMethod	If the specified feedstock or product is gaseous and if molecular weight is measured, report the name of the method used to determine the molecular weight. See list of allowable values: Calculated based on chemical formula and atomic weights 98.244(b)(4)(xv)(B) alternative method Other (specify)
OtherMolecularWeightMethod	If the specified feedstock or product is gaseous, report the name of the method used to determine the molecular weight if "Other (specify)" was reported above.
MolecularWeightAlternativeMethodDetails	A collection of data elements to report if MolecularWeightMethod is "98.244(b)(4)(xv)(B) alternative method".
TitleofMethod	The name or title of the molecular weight alternative method.
Explanation	An explanation of why an alternative method was needed.
FileName	File name of the copy of the alternative method. Include a copy of the file in Word or PDF format in the ZIP file uploaded to e-GGRT.
VolumeTemperatureBasis	If the specified feedstock or product is gaseous, the temperature at which the gaseous feedstock or product volume was measured. See list of allowable values: 60 degrees Fahrenheit 68 degrees Fahrenheit

Figure 23
Sample XML Excerpt for Product and Feedstock Monthly Details

```
<ghg:MonthlyDetails>
        <ghg:MonthName>January</ghg:MonthName>
        <ghg:OtherProductFeedStockDetails>
                <ghg:VolumeorMass>
                        <ghg:IsSubstitutedIndicator>Y</ghg:IsSubstitutedIndicator>
                </ghg:VolumeorMass>
                <ghg:VolumeorMassMethod>Flow meter</ghg:VolumeorMassMethod>
                <ghg:CarbonContent>
                        <ghg:IsSubstitutedIndicator>N</ghg:IsSubstitutedIndicator>
                </ghg:CarbonContent>
                <ghg:CarbonContentMethod>ASTM D1945-03</ghg:CarbonContentMethod>
                <ghg:MolecularWeight>
                        <ghg:IsSubstitutedIndicator>N</ghg:IsSubstitutedIndicator>
                </ghg:MolecularWeight>
                <ghg:MolecularWeightMethod>Calculated based on chemical formula and atomic
        weights</ghg:MolecularWeightMethod>
                        <ghg:VolumeTemperatureBasis>60 degrees
        Fahrenheit</ghg:VolumeTemperatureBasis>
        </ghg:OtherProductFeedStockDetails>
</ghg:MonthlyDetails>
<ghg:MonthlyDetails>
        <ghg:MonthName>February</ghg:MonthName>
        <ghg:OtherProductFeedStockDetails>
                <ghg:VolumeorMass>
                        <ghg:IsSubstitutedIndicator>N</ghg:IsSubstitutedIndicator>
                </ghg:VolumeorMass>
                <ghg:VolumeorMassMethod>Flow meter</ghg:VolumeorMassMethod>
                <ghg:CarbonContent>
                        <ghg:IsSubstitutedIndicator>N</ghg:IsSubstitutedIndicator>
                </ghg:CarbonContent>
                <ghg:CarbonContentMethod>ASTM D1945-03</ghg:CarbonContentMethod>
                <ghg:MolecularWeight>
                        <ghg:IsSubstitutedIndicator>N</ghg:IsSubstitutedIndicator>
                </ghg:MolecularWeight>
                <ghg:MolecularWeightMethod>Calculated based on chemical formula and atomic
        weights</ghg:MolecularWeightMethod>
                        <ghg:VolumeTemperatureBasis>60 degrees
        Fahrenheit</ghg:VolumeTemperatureBasis>
        </ghg:OtherProductFeedStockDetails>
</ghg:MonthlyDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 24
Product, Off-Specification Product and Additional Details Schema Diagram



For each petrochemical process unit, report the following:

- The type of petrochemical produced (Methanol, Carbon black, Acrylonitrile, Ethylene dichloride, Ethylene oxide, or Ethylene) [98.246(a)(2)].
- The annual quantity of the petrochemical produced [98.246(a)(5)].

If the facility complied with the alternative sampling and analysis option in 98.243(c)(4) for a product from this process unit, the following is required:

- The numeric value of the mass or volume of off-spec product(s) produced [98.246(a)(9)]. Note that if the alternative to sampling and analysis is used for more than one carbon-containing product within a process unit, then report the total mass or volume of all of the off-spec products produced.
- The units of measure for the mass or volume of off-spec product produced [98.246(a)(9)].
- The number of days during which off-spec product was produced [98.246(a)(9)]. Note that if the alternative to sampling and analysis is used for more than one carbon-containing product within a process unit, then report the total number of days during which any-off spec product was produced.

The facility has the option of reporting the following wastewater information for each petrochemical process unit:

- The annual average carbon content of the wastewater [98.246(a)(10)].
- The total annual flow of wastewater [98.246(a)(10)].
- The unit of measure for the total annual flow of wastewater [98.246(a)(10)].

The facility has the option of reporting the following unburned carbon releases information for each petrochemical process unit:

- Annual mass of carbon released in fugitive emissions not controlled with a combustion device [98.246(a)(10)].
- Annual mass of carbon released in process vents not controlled with a combustion device [98.246(a)(10)].

Table 9
Product, Off-Specification Product and Additional Details XML Data Elements

Data Element Name	Description
XProductDetails	A collection of data elements containing information about the petrochemical produced by the specified unit.
PetroChemicalProductType	Type of petrochemical produced by the specified unit. See list of allowable values: Methanol Carbon Black Acrylonitrile Ethylene dichloride Ethylene oxide Ethylene
ProductQuantity	A collection of data elements containing information on the annual quantity of the petrochemical produced by the specified unit. Report the measured value only.
ProductQuantity.massUOM	Metric Tons
OffSpecProductMassorVolume	A collection of data elements containing information on the volume or mass of off-specification product produced. Report the total mass or volume of all of the off-spec products produced for which the alternative to sampling and analysis was used for the specified process unit. Report the measured value and either the mass unit of measure or volume unit of measure only.
OffSpecProductMassorVolume.massUOM	Kilograms
OffSpecProductMassorVolume.volUOM	The volume unit of measure used. See list of allowable values: Gallons scf
NumberofDaysOffSpecProductProduced	The number of days during which off-specification product was produced. Report the total number of days for all of the off-spec products produced for which the alternative to sampling and analysis was used for the specified process unit.
AdditionalDetails	A collection of optional data elements to report with additional details about the specified petrochemical process unit.

Data Element Name	Description
CarbonContentofWasteWater	A collection of data elements containing the annual average carbon content of the wastewater. You may elect to report this data element if you also elect to report the data element "AnnualAverageWasteWaterFlow". If so, report the measured value and fraction unit of measure only.
CarbonContentofWasteWater.fractionUOM	decimal fraction
AnnualAverageWasteWaterFlow	A collection of data elements containing the total annual flow of wastewater. You may elect to report this data element if you also elect to report the data element "CarbonContentofWasteWater". If so, report the measured value and the unit of measure only.
AnnualAverageWasteWaterFlow.UnitsofMeasure	Provide the unit of measure for the annual average flow of wastewater: kg gal
CarbonMassofFugitiveEmissions	A collection of data elements containing the annual mass of carbon released in fugitive emissions that are not controlled with a combustion device. You may elect to report this data element. If so, report the measured value and mass unit of measure only.
CarbonMassofFugitiveEmissions.massUOM	Metric Tons
CarbonMassofProcessVents	A collection of data elements containing the annual mass of carbon released in process vents that are not controlled with a combustion device. You may elect to report this data element. If so, report the measured value and mass unit of measure only.
CarbonMassofProcessVents.massUOM	Metric Tons

Figure 25
Sample XML Excerpt for Product, Off-Specification Product and Additional Details

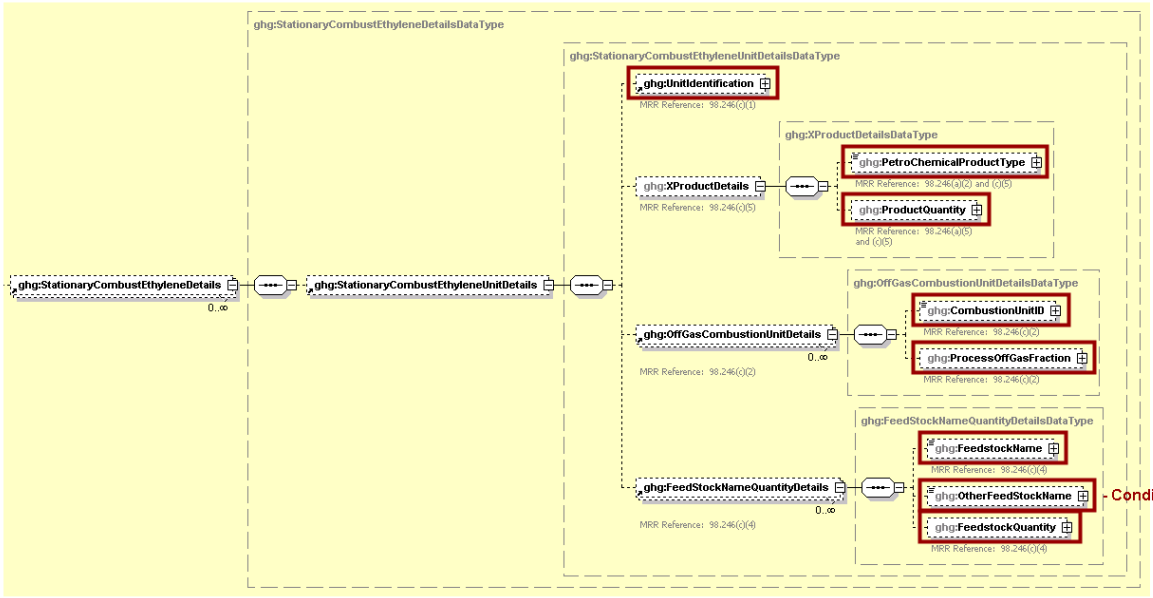
```
        <ghg:XProductDetails>
                <ghg:PetroChemicalProductType>Carbon Black</ghg:PetroChemicalProductType>
                <ghg:ProductQuantity massUOM="Metric Tons">
                        <ghg:MeasureValue>2000</ghg:MeasureValue>
                </ghg:ProductQuantity>
        </ghg:XProductDetails>
        <ghg:OffSpecProductMassorVolume massUOM="Kilograms">
                <ghg:MeasureValue>7</ghg:MeasureValue>
        </ghg:OffSpecProductMassorVolume>
        <ghg:NumberofDaysOffSpecProductProduced>6</ghg:NumberofDaysOffSpecProductProduced>
        <ghg:AdditionalDetails>
        <ghg:CarbonContentofWasteWater fractionUOM="decimal fraction">
                <ghg:MeasureValue>0.02</ghg:MeasureValue>
        </ghg:CarbonContentofWasteWater>
        <ghg:AnnualAverageWasteWaterFlow UnitsofMeasure="kg">
                <ghg:MeasureValue>3000</ghg:MeasureValue>
        </ghg:AnnualAverageWasteWaterFlow>
        <ghg:CarbonMassofFugitiveEmissions massUOM="Metric Tons">
                <ghg:MeasureValue>4000</ghg:MeasureValue>
        </ghg:CarbonMassofFugitiveEmissions>
        <ghg:CarbonMassofProcessVents massUOM="Metric Tons">
                <ghg:MeasureValue>5000</ghg:MeasureValue>
        </ghg:CarbonMassofProcessVents>
    </ghg:AdditionalDetails>
</ghg:MassBalanceDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

4.0 Ethylene Combustion Methodology Details

This section describes information which must be reported for each petrochemical process unit for which the combustion methodology for ethylene production processes of 98.243(d) was used. This method may be used as an alternative to the mass balance option if some process vent emissions and/or emissions from combustion of process off-gas are not routed to a stack that is monitored with CEMS (except flare stacks) to measure CO_2 emissions and the unit is producing ethylene. Note that the combusiton methodology for ethylene production is only an option for process units that produce ethylene.

Figure 26
Ethylene Combustion Methodology Schema Diagram



The facility is required to provide the following for each petrochemical process unit for which the facility specified the ethylene combustion methodology:

- A unique name/identifier [98.246(c)(1)].
- An optional description of the process unit [98.246(c)(1)].
- The unit type: "Petrochemical process unit".
- The type of petrochemical produced: "Ethylene"
- The annual quantity of ethylene produced [98.246 (c)(5)].
- The unit name or identifier of each Subpart C stationary combustion configuration that burns process off-gas from the ethylene process unit [98.246(c)(2)].
- For each Subpart C stationary combustion configuration that burns process off-gas from the ethylene process unit, provide an estimate of the fraction of the configuration's total emissions attributable to combustion of process off-gas from the ethylene process unit [98.246(c)(2)].
- The type of each carbon-containing feedstock fed to the ethylene process unit [98.246(c)(4)].
- The annual quantity of each type of carbon-containing feedstock fed to the ethylene process unit [98.246(c)(4)].

Table 10
Ethylene Combustion Methodology XML Data Elements

Data Element Name	Description
StationaryCombustEthyleneDetails	A collection of data elements containing information on units for which the optional combustion methodology for ethylene production processes was used to monitor emissions.
StationaryCombustEthyleneUnitDetails	A collection of data elements containing information on each unit for which the optional combustion methodology for ethylene production processes was used to monitor emissions.
UnitIdentification	A collection of data elements containing the identity of each petrochemical process unit. It includes the unit ID, an optional brief description, and the unit type: "Petrochemical process unit".
XProductDetails	A collection of data elements containing information about the petrochemical produced by the specified unit.
PetroChemicalProductType	The type of petrochemical produced: "Ethylene".
ProductQuantity	A collection of data elements containing information on the annual quantity of ethylene produced by the specified unit. Report the measured value only.
ProductQuantity.massUOM	Metric Tons
OffGasCombustionUnitDetails	A collection of data elements containing information about each stationary combustion configuration that burns off-gas from the specified ethylene process unit.
CombustionUnitID	The unit name or identifier of each Subpart C stationary combustion configuration that burns process off-gas from the specified ethylene process unit.
ProcessOffGasFraction	A collection of data elements containing information on the fraction of the total emissions from the specified configuration that is attributable to combustion of off-gas from the specified ethylene process unit. Report the measured value only.
ProcessOffGasFraction.fractionUOM	decimal fraction
FeedStockNameQuantityDetails	A collection of data elements containing information on each carbon-containing feedstock fed to the specified ethylene process unit.

Data Element Name	Description
FeedstockName	The name of the carbon-containing feedstock fed to the specified ethylene process unit. See list of allowable values. If the name of the feedstock you are reporting does not appear in the list, then specify "Other" and report its name in the "OtherFeedStockName" data element. Propane Ethane Butane Naphtha Gas oil Natural Gas Liquids Other
OtherFeedStockName	The name of carbon-containing feedstock fed to the specified ethylene process unit if "Other" was specified.
FeedstockQuantity	A collection of data elements containing information on the annual quantity of the carbon-containing feedstock fed to the specified ethylene process unit. Report the measured value and either the mass or volume unit of measure only.
FeedstockQuantity.massUOM	Metric Tons

Figure 27
Sample XML Excerpt for Ethylene Combustion Methodology

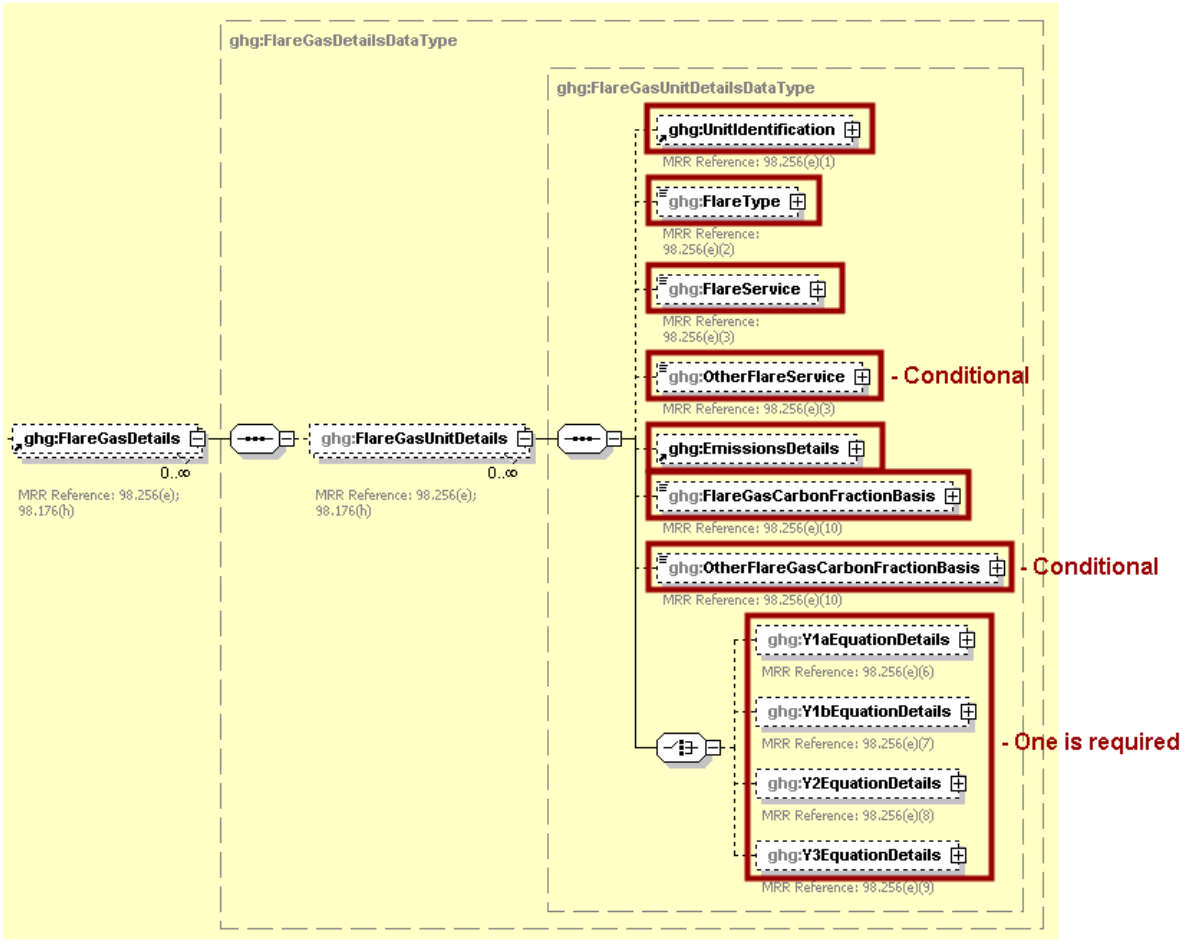
```
<ghg:StationaryCombustEthyleneDetails>
    <ghg:StationaryCombustEthyleneUnitDetails>
        <ghg:UnitIdentification>
            <ghg:UnitName>003- Ethylene</ghg:UnitName>
            <ghg:UnitDescription>Ethylene unit</ghg:UnitDescription>
            <ghg:UnitType>Petrochemical process unit</ghg:UnitType>
        </ghg:UnitIdentification>
        <ghg:XProductDetails>
            <ghg:PetroChemicalProductType>Ethylene</ghg:PetroChemicalProductType>
            <ghg:ProductQuantity massUOM="Metric Tons">
                <ghg:MeasureValue>8000</ghg:MeasureValue>
            </ghg:ProductQuantity>
        </ghg:XProductDetails>
        <ghg:OffGasCombustionUnitDetails>
            <ghg:CombustionUnitID>Unit C-1</ghg:CombustionUnitID>
            <ghg:ProcessOffGasFraction fractionUOM="decimal fraction">
                <ghg:MeasureValue>0.15</ghg:MeasureValue>
            </ghg:ProcessOffGasFraction>
        </ghg:OffGasCombustionUnitDetails>
        <ghg:FeedStockNameQuantityDetails>
            <ghg:FeedstockName>Ethane</ghg:FeedstockName>
            <ghg:FeedstockQuantity massUOM="Metric Tons">
                <ghg:MeasureValue>100</ghg:MeasureValue>
            </ghg:FeedstockQuantity>
        </ghg:FeedStockNameQuantityDetails>
    </ghg:StationaryCombustEthyleneUnitDetails>
</ghg:StationaryCombustEthyleneDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

5.0 Flare Gas Details

If your facility elects to use the CEMS methodology or the combustion methodology for ethylene production processes for one or more petrochemical process units, then information for each flare that burns process off-gas must be reported.

Figure 28
Flare Gas Details Schema Diagram



For each flare, the facility is required to report the following:

- A unique identifier/description [98.256(e)(1)].
- The type of flare [98.256(e)(2)].
- The flare service type [98.256(e)(3)].

Figure 29
Flare Gas Unit Details Schema Diagram

Table 11
Flare Gas Unit Details XML Data Elements

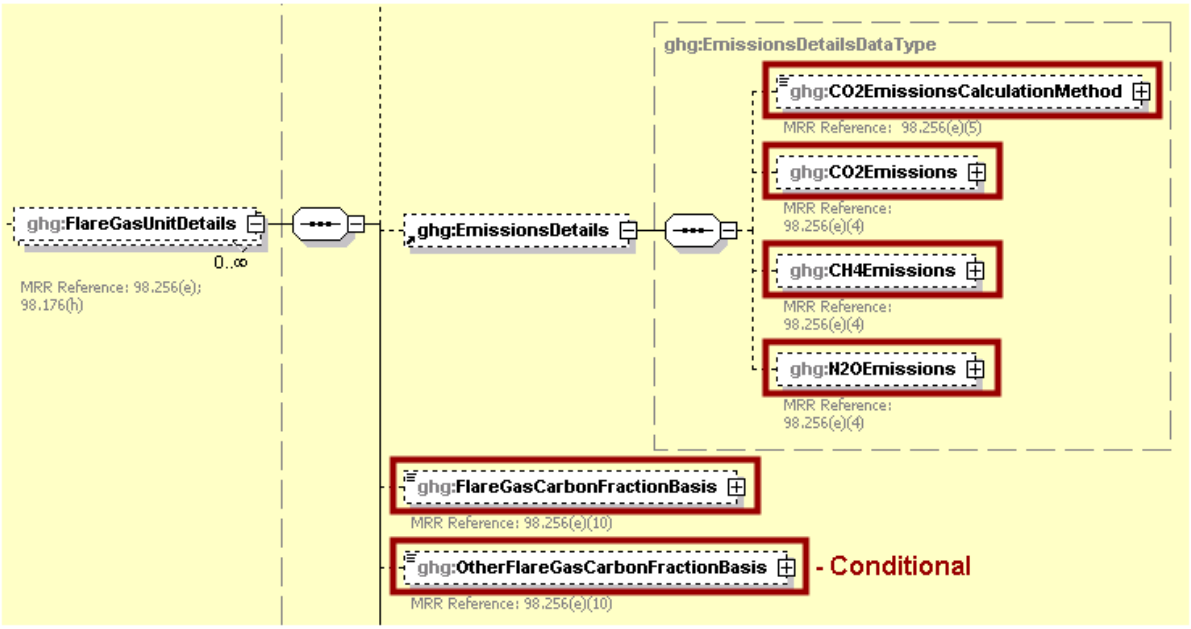
Data Element Name	Description
FlareGasDetails	A collection of data elements containing details about emissions from each flare that burns process off-gas if using CEMS or the ethylene combustion methodology.
FlareGasUnitDetails	A collection of data elements containing details for a specific flare.
UnitIdentification	A collection of data elements containing the identity of each flare. It includes the unit ID, an optional brief description, and the unit type: "Flare".
FlareType	Type of flare. See list of allowable values: Steam assisted Air-assisted Unassisted Other
FlareService	The type of flare service. See list of allowable values: General facility flare Unit flare Emergency only flare Back-up flare Other (specify)
OtherFlareService	Specify the flare service if "Other (specify)" is reported for FlareService.

Figure 30
Sample XML Excerpt for Flare Gas Unit Details

```
<ghg:FlareGasDetails>
    <ghg:FlareGasUnitDetails>
        <ghg:UnitIdentification>
            <ghg:UnitName>007- Flare</ghg:UnitName>
            <ghg:UnitDescription>Flare unit</ghg:UnitDescription>
            <ghg:UnitType>Flare</ghg:UnitType>
        </ghg:UnitIdentification>
        <ghg:FlareType>Other</ghg:FlareType>
        <ghg:FlareService>Back-up flare</ghg:FlareService>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 31
Flare Gas Unit Emissions and Carbon Fraction Basis Schema Diagram



For each flare, the facility is required to report the following:

- The method used to calculate the CO_2 emissions (e.g., reference section and equation number) [98.256(e)(5)].
- Estimated CO_2 emissions [98.256(e)(4)].
- Estimated CH_4 emissions [98.256(e)(4)].
- Estimated N_2O emissions [98.256(e)(4)].
- The basis for the fraction of carbon in the flare gas contributed by methane value [98.256(e)(10)].

Table 12
Flare Gas Unit Emissions and Carbon Fraction Basis XML Data Elements

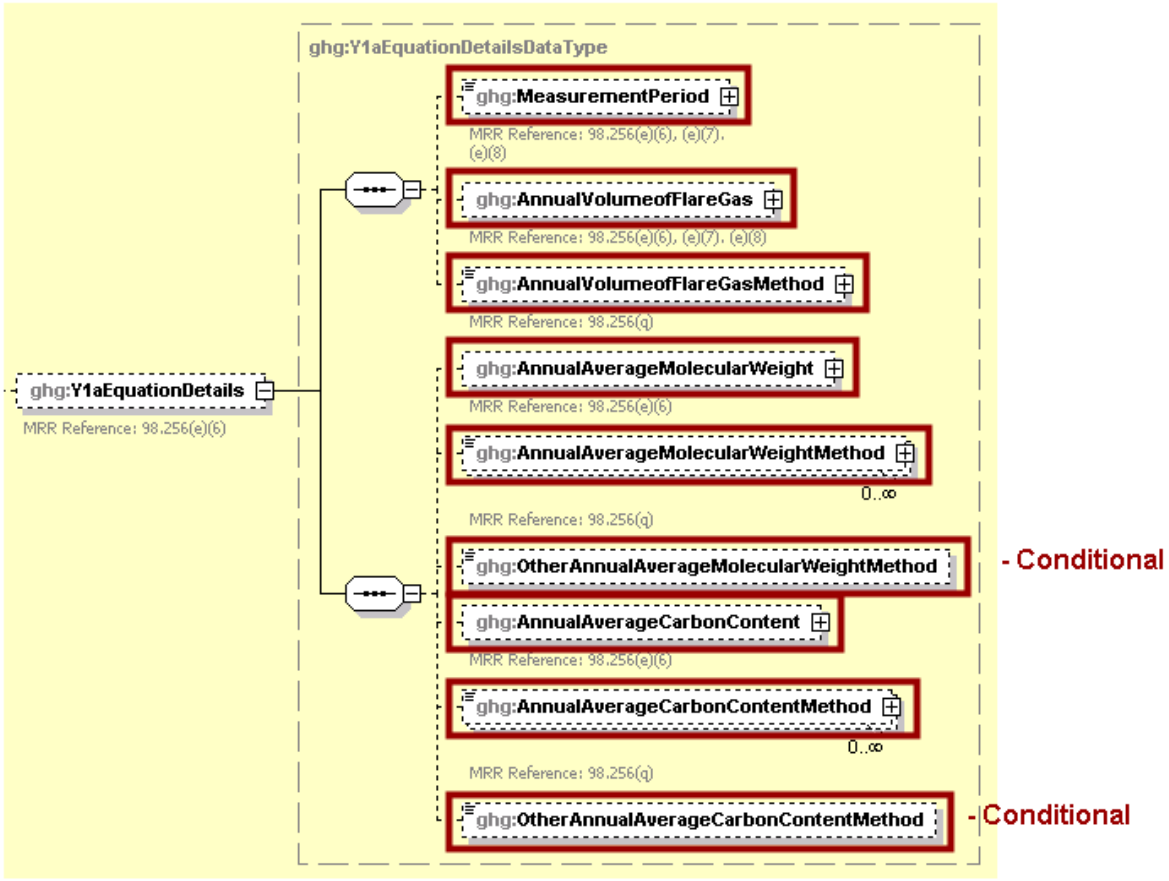
Data Element Name	Description
EmissionsDetails	A collection of data elements containing information the calculated annual emissions for the specified flare.
CO2EmissionsCalculationMethod	The method used to calculate the CO_2 emissions for the specified flare. See list of allowable values: 98.253(b)(1)(ii)(A) – Equation Y-1a – Gas Composition Monitored 98.253(b)(1)(ii)(A) – Equation Y-1b – Gas Composition Monitored 98.253(b)(1)(ii)(B) – Equation Y-2 – Heat Content Monitored 98.253(b)(1)(iii) – Equation Y-3 – Start-up, Shutdown, Malfunction
CO2Emissions	A collection of data elements containing information on the annual CO_2 emissions for the specified flare. Report the calculated value and mass unit of measure only.
CO2Emissions.massUOM	Metric Tons
CH4Emissions	A collection of data elements containing information on the annual CH_4 emissions for the specified flare (the output of Equation Y-4). Report the calculated value and mass unit of measure only.
CH4Emissions.massUOM	Metric Tons
N2OEmissions	A collection of data elements containing information on the annual N_2O emissions for the specified flare (the output of Equation Y-5). Report the calculated value and mass unit of measure only.
N2OEmissions.massUOM	Metric Tons
FlareGasCarbonFractionBasis	Basis for the fraction of carbon in the flare gas contributed by methane. See list of allowable values: Method 18 at 40 CFR part 60, appendix A-6 ASTM D1945-03 ASTM D1946-90 (Reapproved 2006) GPA 2261-00 UOP539-97 ASTM D2503-92 (Reapproved 2007) Chromatographic analysis: manufacturer's instructions Engineering calculations Other (specify)
OtherFlareGasCarbonFractionBasis	Specify the basis for the fraction of carbon in the flare gas contributed by methane if "Other (specify)" is reported for FlareGasCarbonFractionBasis.

Figure 32
Sample XML Excerpt for Flare Gas Unit Emissions and Carbon Fraction Basis

```
<ghg:EmissionsDetails>
        <ghg:CO2Emissions massUOM="Metric Tons">
                <ghg:CalculatedValue>300</ghg:CalculatedValue>
        </ghg:CO2Emissions>
        <ghg:CH4Emissions massUOM="Metric Tons">
                <ghg:CalculatedValue>20</ghg:CalculatedValue>
        </ghg:CH4Emissions>
        <ghg:N2OEmissions massUOM="Metric Tons">
                <ghg:CalculatedValue>10</ghg:CalculatedValue>
        </ghg:N2OEmissions>
</ghg:EmissionsDetails>
<ghg:FlareGasCarbonFractionBasis>ASTM D1946-90 (Reapproved 2006)</ghg:FlareGasCarbonFractionBasis>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 33
Equation Y-1a Details Schema Diagram



For each flare using the Equation Y-1a calculation method, the facility is required to report the following:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(6)].
- The annual volume of flare gas combusted [98.256(e)(6)].
- The number of days missing data procedures were used to measure volume of flare gas combusted.

- Indicate the specific consensus-based standard method number or describe the procedure specified by the flow meter manufacturer used to measure the annual volume of flare gas combusted [98.256(q)].
- The annual average molecular weight [98.256(e)(6)].
- Number of days missing data procedures were used to measure the molecular weight.
- The method(s) used to measure annual average molecular weight [98.256(q)].
- Annual average carbon content of the flare gas [98.256(e)(6)].
- Number of days missing data procedures were used to measure carbon content of the flare gas.
- The method(s) used to measure carbon content of the flare gas [98.256(q)].

Table 13
Equation Y-1a Details XML Data Elements

Data Element Name	Description
Y1aEquationDetails	A collection of data elements to report if Equation Y-1a was used to calculate the CO_2 emissions for the specified flare.
MeasurementPeriod	Frequency of measurement data. See list of allowable values: Daily Weekly
AnnualVolumeofFlareGas	A collection of data elements containing information on the annual volume of flare gas combusted. Report the measured value, volume unit of measure and the number of days missing data procedures were used to determine the volume of flare gas combusted only.
AnnualVolumeofFlareGas.volUOM	scf
AnnualVolumeofFlareGasMethod	Specific consensus-based standard method number used to measure the volume of flare gas or describe the procedure specified by the flow meter manufacturer.
AnnualAverageMolecularWeight	A collection of data elements containing information on the annual average molecular weight of the flare gas. Report the measured value, mole weight unit of measure and the number of days missing data procedures were used to determine molecular weight of the flare gas only.
AnnualAverageMolecularWeight.molewtUOM	kg/kg-mole
AnnualAverageMolecularWeightMethod	Report each method used to determine the annual average molecular weight of the flare gas. See the list of allowable values: Method 18 at 40 CFR part 60, appendix A-6 ASTM D1945-03 ASTM D1946-90 (Reapproved 2006) GPA 2261-00 UOP539-97 ASTM D2503-92 (Reapproved 2007) Chromatographic analysis: manufacturer's instructions Other (specify)

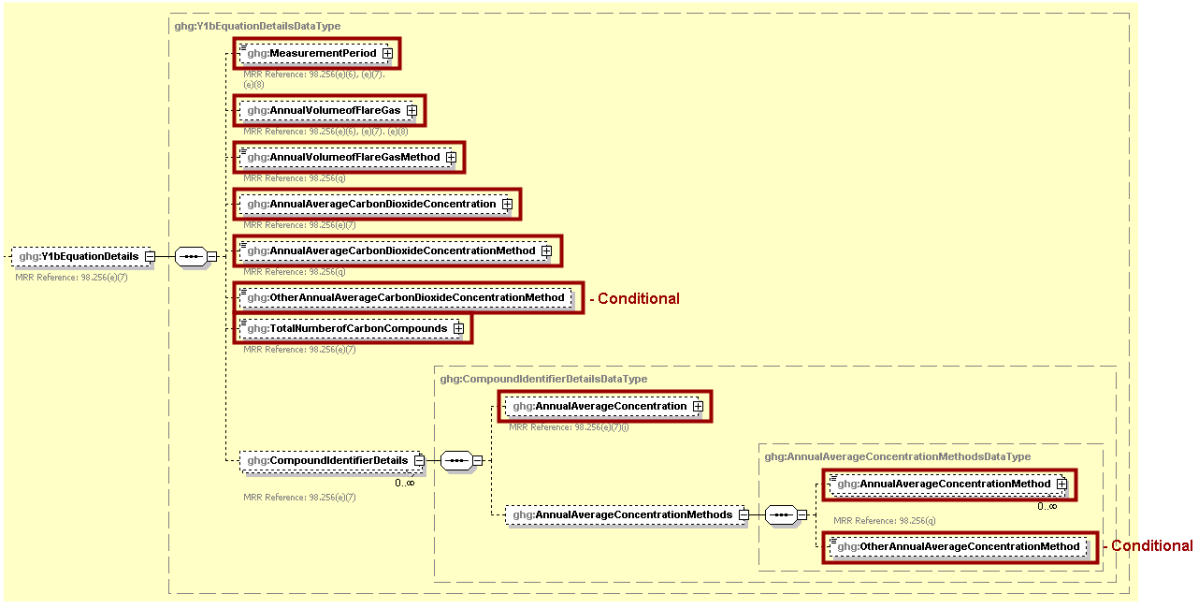
Data Element Name	Description
OtherAnnualAverageMolecularWeightMethod	Report the method used to determine the annual average molecular weight of the flare gas if "Other (specify)" was reported above.
AnnualAverageCarbonContent	A collection of data elements containing information on the annual average carbon content of the flare gas. Report the measured value, the carbon content unit of measure and the number of days missing data procedures were used to determine carbon content of the flare gas only.
AnnualAverageCarbonContent.carboncontentUOM	decimal fraction; kg carbon/kg flare gas
AnnualAverageCarbonContentMethod	Report each method used to determine the annual average carbon content of the flare gas. See the list of allowable values: Method 18 at 40 CFR part 60, appendix A-6 ASTM D1945-03 ASTM D1946-90 (Reapproved 2006) GPA 2261-00 UOP539-97 ASTM D2503-92 (Reapproved 2007) Chromatographic analysis: manufacturer's instructions Other (specify)
OtherAnnualAverageCarbonContentMethod	Report the method used to determine the annual average carbon content of the flare gas if "Other (specify)" was reported above.

Figure 34
Sample XML Excerpt for Equation Y-1a Details

```
<ghg:Y1aEquationDetails>
<ghg:MeasurementPeriod>Weekly</ghg:MeasurementPeriod>
<ghg:AnnualVolumeofFlareGas volUOM="scf">
        <ghg:MeasureValue>800</ghg:MeasureValue>
        <ghg:NumberofTimesSubstituted>7</ghg:NumberofTimesSubstituted>
</ghg:AnnualVolumeofFlareGas>
<ghg:AnnualVolumeofFlareGasMethod>Method A</ghg:AnnualVolumeofFlareGasMethod>
<ghg:AnnualAverageMolecularWeight molewtUOM="kg/kg-mole">
        <ghg:MeasureValue>6</ghg:MeasureValue>
        <ghg:NumberofTimesSubstituted>50</ghg:NumberofTimesSubstituted>
</ghg:AnnualAverageMolecularWeight>
<ghg:AnnualAverageMolecularWeightMethod>Method 18 at 40 CFR part 60, appendix A-
6</ghg:AnnualAverageMolecularWeightMethod>
<ghg:AnnualAverageCarbonContent carboncontentUOM="decimal fraction; kg carbon/kg flare gas">
        <ghg:MeasureValue>0.4</ghg:MeasureValue>
        <ghg:NumberofTimesSubstituted>30</ghg:NumberofTimesSubstituted>
</ghg:AnnualAverageCarbonContent>
<ghg:AnnualAverageCarbonContentMethod>GPA 2261-00</ghg:AnnualAverageCarbonContentMethod>
</ghg:Y1aEquationDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 35
Equation Y-1b Details Schema Diagram



For each flare using the Equation Y-1b calculation method, the facility is required to report the following:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(7)].
- The annual volume of flare gas combusted [98.256(e)(7)].
- The number of days missing data procedures were used to determine the volume of flare gas combusted.
- Indicate the specific consensus-based standard method number or describe the procedure specified by the flow meter manufacturer [98.256(q)].
- The annual average CO_2 concentration [98.256(e)(7)].
- The number of days missing data procedures were used to determine CO_2 concentration.
- The method used to measure CO_2 concentration [98.256(q)].
- The total number of carbon containing compounds other than CO_2 that are in the flare gas stream [98.256(e)(7)].

For each carbon containing compound other than CO_2 in the flare gas stream identified by the facility, and for each flare using the Equation Y-1b, the facility must report the following:

- The annual average concentration of the compound [98.256(e)(7)(i)].
- Number of days missing data procedures were used to determine the concentration of the compound.
- The method(s) used to measure the concentration of the compound [98.256(q)].

Table 14
Equation Y-1b Details XML Data Elements

Data Element Name	Description
Y1bEquationDetails	A collection of data elements to report if Equation Y-1b was used to calculate the CO_2 emissions for the specified flare.
MeasurementPeriod	Frequency of measurement data. See list of allowable values: Daily Weekly
AnnualVolumeofFlareGas	A collection of data elements containing information on the annual volume of flare gas combusted. Report the measured value, volume unit of measure, and the number of days missing data procedures were used to determine the volume of flare gas combusted only.
AnnualVolumeofFlareGas.volUOM	scf
AnnualVolumeofFlareGasMethod	Specific consensus-based standard method number used to measure the volume of flare gas or describe the procedure specified by the flow meter manufacturer.
AnnualAverageCarbonDioxideConcentration	A collection of data elements containing information on the annual average CO_2 content of the flare gas. Report the measured value, concentration unit of measure and number of days missing data procedures were used to determine carbon dioxide concentration of the flare gas only.
AnnualAverageCarbonDioxideConcentration.concentrationUOM	percent by volume or mole
AnnualAverageCarbonDioxideConcentrationMethod	The method used to determine the carbon dioxide concentration of the flare gas. See list of allowable values: Method 18 at 40 CFR part 60, appendix A-6 ASTM D1945-03 ASTM D1946-90 (Reapproved 2006) GPA 2261-00 UOP539-97 ASTM D2503-92 (Reapproved 2007) Chromatographic analysis: manufacturer's instructions Other (specify)
OtherAnnualAverageCarbonDioxideConcentrationMethod	The method used to determine the carbon dioxide concentration of the flare gas if "Other (specify)" was reported above.
TotalNumberofCarbonCompounds	The number of carbon containing compounds other than CO_2 in the flare gas stream (integer).
CompoundIdentifierDetails	A collection of data elements to report for each carbon containing compound (other than CO_2) in the flare gas stream.

Data Element Name	Description
AnnualAverageConcentration	A collection of data elements containing information on the annual average concentration of a specific carbon containing compound (other than CO_2) in the flare gas stream for the specified flare. Report the measured value, concentration unit of measure and the number of days missing data procedures were used to determine the concentration of the compound only.
AnnualAverageConcentration.concentration UOM	percent by volume or mole
AnnualAverageConcentrationMethods	A collection of data elements containing the method(s) used to determine the annual average concentration of the specific carbon containing compound (other than CO_2).
AnnualAverageConcentrationMethod	Report each method used to determine the annual average concentration of the specific carbon containing compound (other than CO_2). See list of allowable values: Method 18 at 40 CFR part 60, appendix A-6 ASTM D1945-03 ASTM D1946-90 (Reapproved 2006) GPA 2261-00 UOP539-97 ASTM D2503-92 (Reapproved 2007) Chromatographic analysis: manufacturer's instructions Other (specify)
OtherAnnualAverageConcentrationMethod	Report the method used to determine the annual average concentration of the specific carbon containing compound (other than CO_2) if "Other (specify)" was reported above.

Figure 36
Sample XML Excerpt for Equation Y-1b Details

```
<ghg:Y1bEquationDetails>
        <ghg:MeasurementPeriod>Daily</ghg:MeasurementPeriod>
        <ghg:AnnualVolumeofFlareGas volUOM="scf">
                <ghg:MeasureValue>400</ghg:MeasureValue>
                <ghg:NumberofTimesSubstituted>30</ghg:NumberofTimesSubstituted>
        </ghg:AnnualVolumeofFlareGas>
        <ghg:AnnualVolumeofFlareGasMethod>Specific consensus-based standard method
                        A</ghg:AnnualVolumeofFlareGasMethod>
        <ghg:AnnualAverageCarbonDioxideConcentration concentrationUOM="percent by volume or mole">
                <ghg:MeasureValue>20</ghg:MeasureValue>
                <ghg:NumberofTimesSubstituted>10</ghg:NumberofTimesSubstituted>
        </ghg:AnnualAverageCarbonDioxideConcentration>
        <ghg:AnnualAverageCarbonDioxideConcentrationMethod>ASTM D1945-
                        03</ghg:AnnualAverageCarbonDioxideConcentrationMethod>
        <ghg:TotalNumberofCarbonCompounds>1</ghg:TotalNumberofCarbonCompounds>
        <ghg:CompoundIdentifierDetails>
                <ghg:AnnualAverageConcentration concentrationUOM="percent by volume or mole">
                        <ghg:MeasureValue>15</ghg:MeasureValue>
                        <ghg:NumberofTimesSubstituted>25</ghg:NumberofTimesSubstituted>
                </ghg:AnnualAverageConcentration>
                <ghg:AnnualAverageConcentrationMethods>
                        <ghg:AnnualAverageConcentrationMethod>ASTM D1945-
                                        03</ghg:AnnualAverageConcentrationMethod>
                        <ghg:AnnualAverageConcentrationMethod>Chromatographic analysis: manufacturer's
                                        instructions</ghg:AnnualAverageConcentrationMethod>
                </ghg:AnnualAverageConcentrationMethods>
        </ghg:CompoundIdentifierDetails>
</ghg:Y1bEquationDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 37
Equation Y-2 Details Schema Diagram

For each flare using the Equation Y-2 calculation method, the facility must identify the following:

- An indication of whether daily or weekly measurement periods are used [98.256(e)(8)].
- The annual volume of flare gas combusted [98.256(e)(8)].
- The number of days missing data procedures were used to determine the volume of flare gas combusted.
- The specific consensus-based standard method number or describe the procedure specified by the flow meter manufacturer [98.256(q)].
- The annual average higher heating value of the flare gas [98.256(e)(8)].
- The number of days missing data procedures were used to determine the annual average higher heating value of the flare gas.
- The method used to measure the annual average higher heating value of the flare gas [98.256(q)].
- An indication of whether the annual volume of flare gas combusted was determined using standard conditions of 68 ºF and 14.7 psia or 60 ºF and 14.7 psia [98.256(e)(8)].
- An indication of whether the annual average higher heating value of the flare gas was determined using standard conditions of 68 ºF and 14.7 psia or 60 ºF and 14.7 psia [98.256(e)(8)].

Table 15
Equation Y-2 Details XML Data Elements

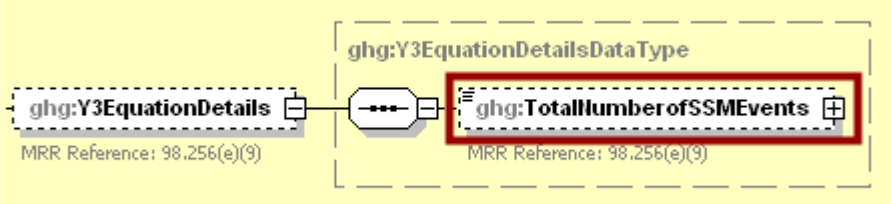
Data Element Name	Description
Y2EquationDetails	A collection of data elements to report if Equation Y-2 was used to calculate the CO_2 emissions for the specified flare gas unit.
MeasurementPeriod	Frequency of measurement data. See list of allowable values: Daily Weekly
AnnualVolumeofFlareGas	A collection of data elements containing information on the annual volume of flare gas combusted. Report the measured value, volume unit of measure, and the number of days missing data procedures were used to determine the volume of flare gas combusted only.
AnnualVolumeofFlareGas.volUOM	MMscf
AnnualVolumeofFlareGasMethod	Specific consensus-based standard method number or describe the procedure specified by the flow meter manufacturer.
AnnualAverageHigherHeatingValue	A collection of data elements containing information on the annual average higher heating value of the flare gas. Report the measured value and the number of days missing data procedures were used to determine the higher heating value only.
AnnualAverageHigherHeatingValue.heatUOM	MMBtu/MMscf
AnnualAverageHigherHeatingValueMethod	The method used to determine the annual average higher heating value of the flare gas. See list of allowable values: ASTM D4809-06 ASTM D240-02 (Reapproved 2007) ASTM D1826-94 (Reapproved 2003) ASTM D3588-98 (Reapproved 2003) ASTM D4891-89 (Reapproved 2006) Chromatographic analysis: manufacturer's instructions Other (specify)
OtherAnnualAverageHigherHeatingValueMethod	The method used to determine the annual average higher heating value of the flare gas if "Other (specify)" was reported above.
FlareGasConditions	Conditions at which the annual volume of flare gas was determined: by using standard conditions of 68 degrees F and 14.7 psia or 60 degrees F and 14.7 psia.
HeatingValueConditions	Conditions at which the annual average higher heating value was determined: by using standard conditions of 68 degrees F and 14.7 psia or 60 degrees F and 14.7 psia.

Figure 38
Sample XML Excerpt for Equation Y-2 Details

```
<ghg:Y2EquationDetails>
        <ghg:MeasurementPeriod>Daily</ghg:MeasurementPeriod>
        <ghg:AnnualVolumeofFlareGas volUOM="MMscf">
                <ghg:MeasureValue>900</ghg:MeasureValue>
                <ghg:NumberofTimesSubstituted>80</ghg:NumberofTimesSubstituted>
        </ghg:AnnualVolumeofFlareGas>
        <ghg:AnnualVolumeofFlareGasMethod>Specific consensus-based standard method
                        B</ghg:AnnualVolumeofFlareGasMethod>
        <ghg:AnnualAverageHigherHeatingValue heatUOM="MMBtu/MMscf">
                <ghg:MeasureValue>70</ghg:MeasureValue>
                <ghg:NumberofTimesSubstituted>60</ghg:NumberofTimesSubstituted>
        </ghg:AnnualAverageHigherHeatingValue>
        <ghg:AnnualAverageHigherHeatingValueMethod>ASTM D240-02 (Reapproved
                        2007)</ghg:AnnualAverageHigherHeatingValueMethod>
        <ghg:FlareGasConditions>68 degrees F and 14.7 psia</ghg:FlareGasConditions>
        <ghg:HeatingValueConditions>68 degrees F and 14.7 psia</ghg:HeatingValueConditions>
</ghg:Y2EquationDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Figure 39
Equation Y-3 Details Schema Diagram



For each flare using the Equation Y-3 calculation method, the facility must identify the total number of start-up, shutdown, or malfunction (SSM) events exceeding 500,000 scf/day [98.256(e)(9)].

Table 16
Equation Y-3 Details XML Data Elements

Data Element Name	Description
Y3EquationDetails	A collection of data elements to report if Equation Y-3 was used to calculate the CO_2 emissions for the specified flare.
TotalNumberofSSMEvents	Report the total number of start-up, shutdown, or malfunction (SSM) events exceeding 500,000 scf/day (integer).

Figure 40
Sample XML Excerpt for Equation Y-3 Details

```
<ghg:Y3EquationDetails>
        <ghg:TotalNumberofSSMEvents>25</ghg:TotalNumberofSSMEvents>
</ghg:Y3EquationDetails>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

6.0 Facility-Level Roll-up Emissions

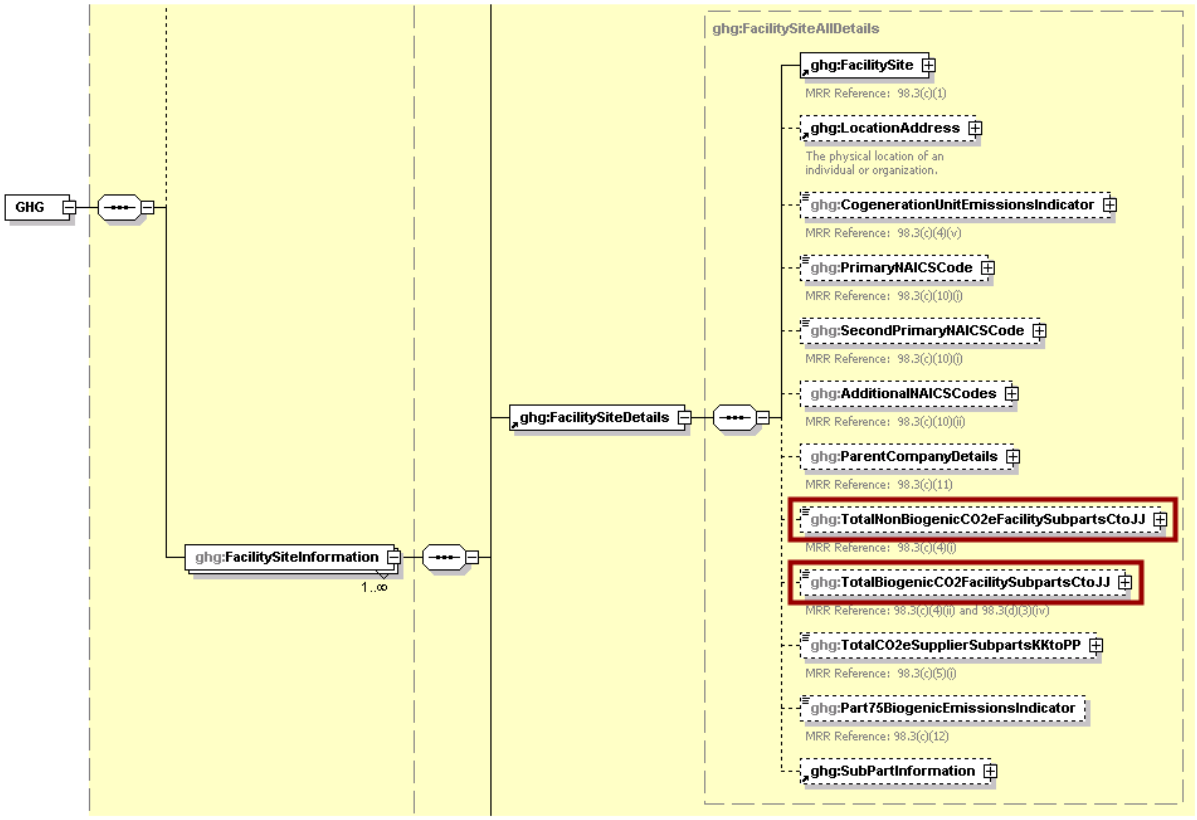
Each facility must report the following facility-level emission totals:

- Total CO_2 equivalent (CO_2e) emissions (excluding biogenic CO_2) aggregated across all direct emitter source categories (subparts C-HH) associated with the facility.
- Total biogenic CO_2 emissions aggregated across all direct emitter source categories (subparts C-HH) associated with the facility.

Each supplier must report the following supplier totals:

- Total CO_2e associated with products supplied aggregated across subparts NN, OO and PP (as applicable). Do not include subpart LL and MM totals in this data element as these values are not being collected in e-GGRT.

Figure 41
Facility-Level Roll-up Emissions Schema Diagram



For Subpart X, report total emissions for CO_2e (excluding biogenic CO_2) and biogenic CO_2 using the following guidelines.

1) Add the total CO_2e value for subpart X in metric tons to the total CO_2e emissions (excluding biogenic CO_2) aggregated across all source category subparts associated with the facility as follows:
   - Add the annual CO_2 mass emissions from process operations and process off-gas for each unit in metric tons rounded to nearest whole number.
   - Add the annual CO_2 mass emissions from each flare in metric tons rounded to nearest whole number.

- Add the total annual CO_2 mass emissions measured by each CEMS in metric tons rounded to nearest whole number minus the total annual biogenic CO_2 mass emissions for each CEMS monitoring location in metric tons rounded to nearest whole number (the difference of the total CO_2 monitored by each CEMS and the total biogenic CO_2).
- Multiply the total annual CH_4 mass emissions from each flare in metric tons rounded to two decimal places by the Global Warming Potential for CH_4 (21) and add the result.
- Multiply the total annual N_2O mass emissions from each flare in metric tons rounded to three decimal places by the Global Warming Potential for N_2O (310) and add the result.
- Multiply the total annual CH_4 mass emissions for each CEMS monitoring location in metric tons rounded to two decimal places by the Global Warming Potential for CH_4 (21) and add the result.
- Multiply the total annual N_2O mass emissions for each CEMS monitoring location in metric tons rounded to three decimal places by the Global Warming Potential for N_2O (310) and add the result.

2) Add the total annual biogenic CO_2 mass emissions in metric tons rounded to nearest whole number for each CEMS monitoring location to the total biogenic CO_2 aggregated across all source category subparts associated with the facility.

Table 17
Facility Level Roll-up Emissions XML Data Elements

Data Element Name	Description
TotalNonBiogenicCO2eFacilitySubpartsCtoJJ	Add the total CO_2e value for subpart X in metric tons to the total CO_2e emissions (excluding biogenic CO_2) aggregated across all source category subparts associated with the facility according to the guidelines above.
TotalNonBiogenicCO2eFacilitySubpartsCtoJJ.massUOM	Metric Tons
TotalBiogenicCO2FacilitySubpartsCtoJJ	Add the total annual biogenic CO_2 value for subpart X in metric tons to the total biogenic CO_2 emissions aggregated across all source category subparts associated with the facility according to the guideline above.
TotalBiogenicCO2FacilitySubpartsCtoJJ.massUOM	Metric Tons

Figure 42
Sample XML Excerpt for Facility Level Roll-up Emissions

```
<ghg:TotalNonBiogenicCO2eFacilitySubpartsCtoJJ massUOM="Metric
Tons">33730</ghg:TotalNonBiogenicCO2eFacilitySubpartsCtoJJ>
<ghg:TotalBiogenicCO2FacilitySubpartsCtoJJ massUOM="Metric Tons">600</ghg:TotalBiogenicCO2FacilitySubpartsCtoJJ>
<ghg:TotalCO2eSupplierSubpartsKKtoPP massUOM="Metric Tons">0</ghg:TotalCO2eSupplierSubpartsKKtoPP>
```

Note: The code excerpt above is presented here to demonstrate the concept of reporting greenhouse gas emissions data.

Appendix A

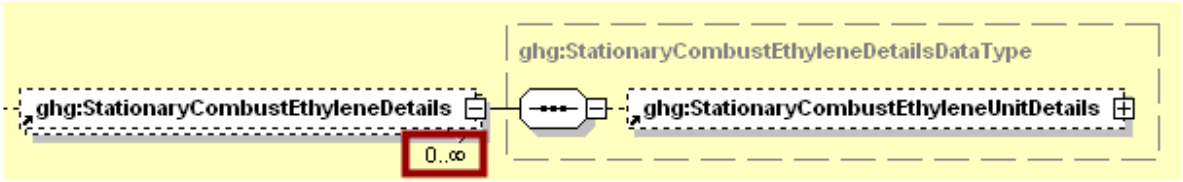
Legend for Tables

Blue = parent element

Legend for XML Schema

Red box = relevant for reporting

The following XML symbol "0..∞" means that multiple occurrences for the parent element can be reported:



The following XML symbol for "or" means that only one of the data elements following the sign can be reported for the current instance of the parent element:

Appendix B

Sample XML Document for Subpart X

(Note: Data values do not reflect an actual facility's emissions.)

```
<ghg:GHG xmlns="http://www.ccdsupport.com/schema/ghg">
  <ghg:FacilitySiteInformation>
  <ghg:CertificationStatement>The designated representative or alternate designated representative must sign (i.e., agree to) this certification statement. If you are an agent and you click on  "SUBMIT", you are not agreeing to the certification statement, but are submitting the certification statement on behalf of the designated  representative or alternate designated representative who is agreeing to the certification statement. An agent is only authorized to make the electronic submission on behalf of the designated representative, not to sign (i.e., agree to) the certification statement.</ghg:CertificationStatement>
  <ghg:ReportingYear>2010</ghg:ReportingYear>
  <ghg:FacilitySiteDetails>
        <ghg:FacilitySite>
              <ghg:FacilitySiteIdentifier>524497</ghg:FacilitySiteIdentifier>
              <ghg:FacilitySiteName>Test Facility X</ghg:FacilitySiteName>
        </ghg:FacilitySite>
        <ghg:LocationAddress>
              <ghg:LocationAddressText>1 Main St.</ghg:LocationAddressText>
              <ghg:LocalityName>Charlottesville</ghg:LocalityName>
              <ghg:StateIdentity>
                    <ghg:StateCode>VA</ghg:StateCode>
              </ghg:StateIdentity>
              <ghg:AddressPostalCode>22911</ghg:AddressPostalCode>
        </ghg:LocationAddress>
        <ghg:CogenerationUnitEmissionsIndicator>N</ghg:CogenerationUnitEmissionsIndicator>
        <ghg:PrimaryNAICSCode>324110</ghg:PrimaryNAICSCode>
        <ghg:TotalNonBiogenicCO2eFacilitySubpartsCtoJJ massUOM="Metric Tons">22570</ghg:TotalNonBiogenicCO2eFacilitySubpartsCtoJJ>
        <ghg:TotalBiogenicCO2FacilitySubpartsCtoJJ massUOM="Metric Tons">600</ghg:TotalBiogenicCO2FacilitySubpartsCtoJJ>
        <ghg:TotalCO2eSupplierSubpartsKKtoPP massUOM="Metric Tons">0</ghg:TotalCO2eSupplierSubpartsKKtoPP>
        <ghg:SubPartInformation>
              <ghg:SubPartX>
                    <ghg:GHGasInfoDetails>
                          <ghg:GHGasName>Biogenic Carbon dioxide</ghg:GHGasName>
                          <ghg:GHGasQuantity massUOM="Metric Tons">
                                <ghg:CalculatedValue>600</ghg:CalculatedValue>
                          </ghg:GHGasQuantity>
                    </ghg:GHGasInfoDetails>
                    <ghg:GHGasInfoDetails>
                          <ghg:GHGasName>Methane</ghg:GHGasName>
                          <ghg:GHGasQuantity massUOM="Metric Tons">
                                <ghg:CalculatedValue>280</ghg:CalculatedValue>
                          </ghg:GHGasQuantity>
                    </ghg:GHGasInfoDetails>
                    <ghg:GHGasInfoDetails>
                          <ghg:GHGasName>Nitrous Oxide</ghg:GHGasName>
                          <ghg:GHGasQuantity massUOM="Metric Tons">
                                <ghg:CalculatedValue>19</ghg:CalculatedValue>
                          </ghg:GHGasQuantity>
                    </ghg:GHGasInfoDetails>
                    <ghg:GHGasInfoDetails>
                          <ghg:GHGasName>Carbon Dioxide</ghg:GHGasName>
                          <ghg:GHGasQuantity massUOM="Metric Tons">
                                <ghg:CalculatedValue>10800</ghg:CalculatedValue>
                          </ghg:GHGasQuantity>
                    </ghg:GHGasInfoDetails>
                    <ghg:CEMSDetails>
                          <ghg:CEMSUnitDetails>
                                <ghg:UnitIdentification>
                                      <ghg:UnitName>001-CEMS</ghg:UnitName>
                                      <ghg:UnitDescription>CEMS unit</ghg:UnitDescription>
                                      <ghg:UnitType>Petrochemical process unit</ghg:UnitType>
                                </ghg:UnitIdentification>
                                <ghg:XProductDetails>
                                      <ghg:PetroChemicalProductType>Methanol</ghg:PetroChemicalProductType>
                                      <ghg:ProductQuantity massUOM="Metric Tons">
                                            <ghg:MeasureValue>1000</ghg:MeasureValue>
                                      </ghg:ProductQuantity>
                                </ghg:XProductDetails>
                          </ghg:CEMSUnitDetails>
                          <ghg:XTier4CEMSDetails>
                                <ghg:CEMSMonitoringLocation>
                                      <ghg:Name>005- CML</ghg:Name>
                                      <ghg:Description>CML</ghg:Description>
```

```
                        <ghg:Type>Single process/process unit exhausts to dedicated
                        stack</ghg:Type>
                    </ghg:CEMSMonitoringLocation>
                    <ghg:CO2EmissionsAllBiomassFuelsCombined massUOM="Metric Tons">
                        <ghg:CalculatedValue>600</ghg:CalculatedValue>
                    </ghg:CO2EmissionsAllBiomassFuelsCombined>
                    <ghg:CO2EmissionsNonBiogenic massUOM="Metric Tons">
                        <ghg:CalculatedValue>700</ghg:CalculatedValue>
                    </ghg:CO2EmissionsNonBiogenic>
                    <ghg:AnnualCO2EmissionsMeasuredByCEMS massUOM="Metric Tons">
                        <ghg:CalculatedValue>1500</ghg:CalculatedValue>
                    </ghg:AnnualCO2EmissionsMeasuredByCEMS>
                    <ghg:TotalCH4CombustionEmissions massUOM="Metric Tons">
                        <ghg:CalculatedValue>80</ghg:CalculatedValue>
                    </ghg:TotalCH4CombustionEmissions>
                    <ghg:TotalN2OCombustionEmissions massUOM="Metric Tons">
                        <ghg:CalculatedValue>9</ghg:CalculatedValue>
                    </ghg:TotalN2OCombustionEmissions>
                    <ghg:Tier4QuarterDetails>
                        <ghg:QuarterName>First Quarter</ghg:QuarterName>
                        <ghg:CumulativeCO2MassEmissions massUOM="Metric Tons">
                            <ghg:CalculatedValue>100</ghg:CalculatedValue>
                        </ghg:CumulativeCO2MassEmissions>
                    </ghg:Tier4QuarterDetails>
                    <ghg:Tier4QuarterDetails>
                        <ghg:QuarterName>Second Quarter</ghg:QuarterName>
                        <ghg:CumulativeCO2MassEmissions massUOM="Metric Tons">
                            <ghg:CalculatedValue>200</ghg:CalculatedValue>
                        </ghg:CumulativeCO2MassEmissions>
                    </ghg:Tier4QuarterDetails>
                    <ghg:Tier4QuarterDetails>
                        <ghg:QuarterName>Third Quarter</ghg:QuarterName>
                        <ghg:CumulativeCO2MassEmissions massUOM="Metric Tons">
                            <ghg:CalculatedValue>300</ghg:CalculatedValue>
                        </ghg:CumulativeCO2MassEmissions>
                    </ghg:Tier4QuarterDetails>
                    <ghg:Tier4QuarterDetails>
                        <ghg:QuarterName>Fourth Quarter</ghg:QuarterName>
                        <ghg:CumulativeCO2MassEmissions massUOM="Metric Tons">
                            <ghg:CalculatedValue>400</ghg:CalculatedValue>
                        </ghg:CumulativeCO2MassEmissions>
                    </ghg:Tier4QuarterDetails>
                    <ghg:TotalSourceOperatingHours>8000</ghg:TotalSourceOperatingHours>
                    <ghg:OperatingHoursDetails>
                        <ghg:OperatingHoursCO2ConcentrationSubstituted>10</ghg:Ope
                        ratingHoursCO2ConcentrationSubstituted>
                        <ghg:OperatingHoursStackGasFlowRateSubstituted>20</ghg:Ope
                        ratingHoursStackGasFlowRateSubstituted>
                        <ghg:OperatingHoursStackGasMoistureContentSubstituted>30</g
                        hg:OperatingHoursStackGasMoistureContentSubstituted>
                    </ghg:OperatingHoursDetails>
                    <ghg:TierMethodologyStartDate>2010-01-
                    01</ghg:TierMethodologyStartDate>
                    <ghg:TierMethodologyEndDate>2010-12-
                    31</ghg:TierMethodologyEndDate>
                    <ghg:SlipStreamIndicator>Y</ghg:SlipStreamIndicator>
                    <ghg:CEMSFuel>coal, coke, natural gas</ghg:CEMSFuel>
                    <ghg:XProcessUnits>
                        <ghg:ProcessUnitName>
                            <ghg:UnitName>001-CEMS</ghg:UnitName>
                        </ghg:ProcessUnitName>
                        <ghg:CarbonDioxideFraction fractionUOM="decimal fraction">
                            <ghg:MeasureValue>0.05</ghg:MeasureValue>
                        </ghg:CarbonDioxideFraction>
                        <ghg:MethaneFraction fractionUOM="decimal fraction">
                            <ghg:MeasureValue>0.07</ghg:MeasureValue>
                        </ghg:MethaneFraction>
                        <ghg:NitrousOxideFraction fractionUOM="decimal fraction">
                            <ghg:MeasureValue>0.06</ghg:MeasureValue>
                        </ghg:NitrousOxideFraction>
                    </ghg:XProcessUnits>
                </ghg:XTier4CEMSDetails>
            </ghg:CEMSDetails>
            <ghg:MassBalanceDetails>
                <ghg:UnitIdentification>
                    <ghg:UnitName>002- Mass</ghg:UnitName>
                    <ghg:UnitDescription>Mass unit</ghg:UnitDescription>
                    <ghg:UnitType>Petrochemical process unit</ghg:UnitType>
                </ghg:UnitIdentification>
                <ghg:AnnualCO2Emissions massUOM="Metric Tons">
                    <ghg:CalculatedValue>9000.0</ghg:CalculatedValue>
                </ghg:AnnualCO2Emissions>
```

```
<ghg:CombustionUnitIdentifiers>None</ghg:CombustionUnitIdentifiers>
<ghg:ProductFeedStockDetails>
        <ghg:Name>Coal</ghg:Name>
        <ghg:Type>Coal</ghg:Type>
        <ghg:PhysicalState>Solid</ghg:PhysicalState>
        <ghg:ProcessChangeDates>1/1/2010</ghg:ProcessChangeDates>
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                        tutedIndicator>
                        </ghg:CarbonContent>
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        </ghg:MonthlyDetails>
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                                tutedIndicator>
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```

```
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```

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                        <ghg:Type>Natural gas</ghg:Type>
                        <ghg:PhysicalState>Gaseous</ghg:PhysicalState>
                        <ghg:FlowMeterDetails>
                            <ghg:ManufacturersRecommendedMethod>Description
                            A</ghg:ManufacturersRecommendedMethod>
                            <ghg:CalibrationMethod>Description B</ghg:CalibrationMethod>
                        </ghg:FlowMeterDetails>
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                                </ghg:MolecularWeight>
                                <ghg:MolecularWeightMethod>Calculated based on
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                                Fahrenheit</ghg:VolumeTemperatureBasis>
```

```
            </ghg:OtherProductFeedStockDetails>
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        <ghg:MonthlyDetails>
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                </ghg:MolecularWeight>
                <ghg:MolecularWeightMethod>Calculated based on
                chemical formula and atomic
                weights</ghg:MolecularWeightMethod>
                <ghg:VolumeTemperatureBasis>60 degrees
                Fahrenheit</ghg:VolumeTemperatureBasis>
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        </ghg:MonthlyDetails>
        <ghg:MonthlyDetails>
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```

```
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